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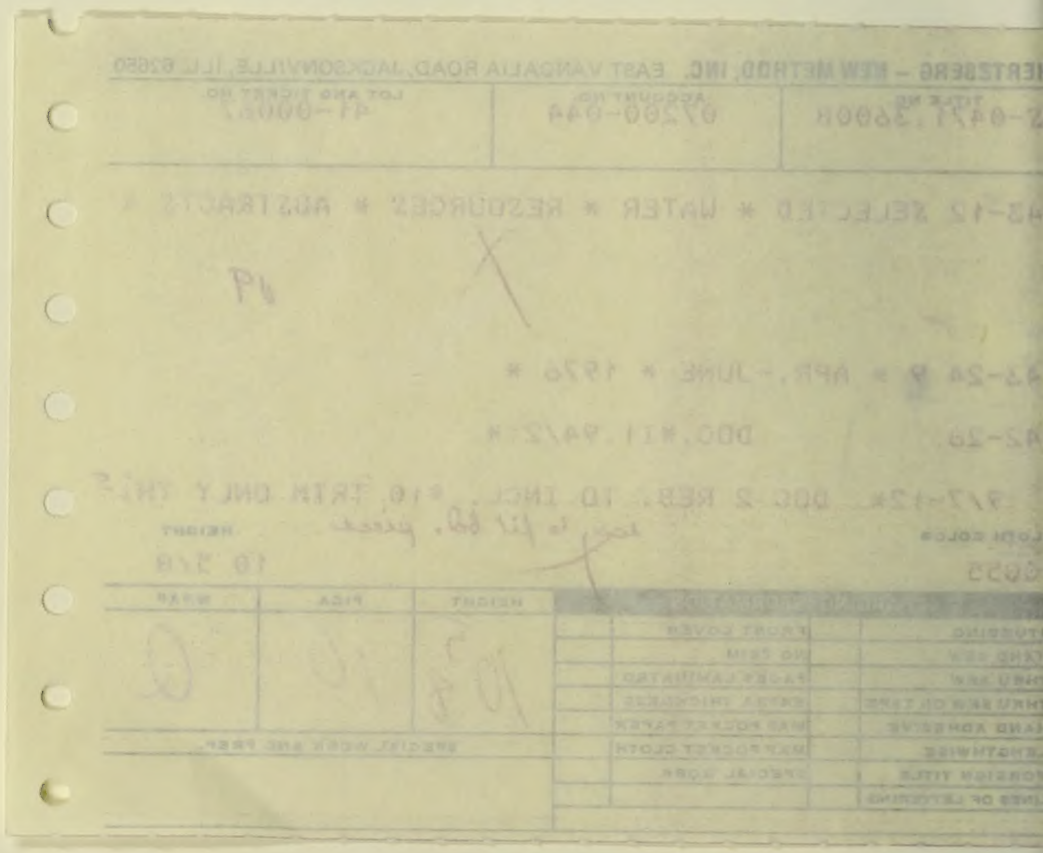

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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 7
APRIL 1, 1976

W76-03001 -- W76-03299

Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

A NEUTRON SCATTERING STUDY OF WATER AND IONIC SOLUTIONS - 1967, FIRST REPORT,
Union Carbide Corp., Tuxedo, N. Y. Sterling Forest Research Center.
G. J. Safford, A. W. Naumann, and P. C. Schaffer.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 718, $6.00 in paper copy, $2.25 in microfiche. OSW Reasearch and Development Progress Report No 280 (OSW/RDPR/280), September 1967. 112 p, 41 fig, 5 tab, 71 ref, 3 append.

Descriptors: *Water properties, *Water structure, Molecular structure, Salts, Chemical properties, Neutron activation analysis, Ion exchange, Cations, Anions, Kinetics, Analytical techniques, Model studies.
Identifiers: Neutron scattering, Diffusive kinetics, Intermolecular frequencies.

The spectroscopic technique of neutron inelastic scattering has been used to examine the bonding and diffusive motions of H20 molecules in water and certain ionic solutions in an effort to relate them to models of the water structure and its modification by ions. Measurements of the vibrational spectra of water have been made from 1C to 95C. Information on the type of changes induced in the water structure by ions has been obtained from studies of the intermolecular frequencies in salt solutions. Measurements have been made to study in detail the modifications of the diffusive kinetics in water by selected ions. The data show that a reduction in temperature (i.e. to 1C) increases the residence time, decreases the diffusion constant, and intensifies any frequencies characteristic of a solid hydrate. Certain salts, even at higher concentrations, cause only a small modification of the water structure. Investigations of vibration spectra of ions in solutions also show that while distinct variations occur in the vibrational spectra of water molecules due to ions in solutions, the variation in the average vibrational period with temperature is not large. (See also W76-03261) (OWRT)
W76-03260

A NEUTRON SCATTERING STUDY OF WATER AND IONIC SOLUTIONS,
Union Carbide Corp., Tuxedo, N.Y.
G. J. Safford, and P. S. Leung.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-203 120, $4.00 in paper copy, $2.25 in microfiche. Research and development progress report, Sep 69, 42 p, OSW-PR-485. DI 14-01-0001-1484.

Descriptors: Neutron activation analysis, Diffusion, Electrolytes, *Kinetics, *Water properties, *Anions, *Cations, Salts, *Molecular structures, *Water structures, Chemical analysis, Aqueous solutions, *Chlorides, Calcium chloride, Sodium chloride, Magnesium compounds, *Ion exchange, Fluorides, Halides, Analytical techniques.
Identifiers: *Neutron scattering, Diffusive kinetics, Intermolecular frequencies, Magnesium chloride.

Neutron inelastic scattering was used to study the dependences on concentration, cations, and anions of the intermolecular frequencies and the diffusive kinetics of water molecules in aqueous solutions. The intermolecular frequencies at lower concentrations of magnesium chloride, NaCl and CsCl were nearly identical with those of water with increasing concentration, new frequencies characteristic of primary hydration complexes appeared and intensified. The frequencies and diffusive parameters of solutions containing small or highly charged cations were primarily determined by the cations and only secondarily affected by monovalent anions. In contrast, a strong dependence on anions in solutions of larger, singe-charged cations was observed at intermolecular frequencies and in diffusive kinetics. (See also W76-03260) (OWRT)
W76-03261

2. WATER CYCLE

2A. General

FLOW FORECASTING FOR THE BULL RUN WATERSHED,
Multinomah County Div. of Planning and Development, Portland, Oreg.
For primary bibliographic entry see Field 4D.
W76-03109

WATER QUALITY IN A TROPICAL RAIN FORESTED CATCHMENT,
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-03132

HYBRID FORMULATION OF KINEMATIC WAVE MODELS OF WATERSHED RUNOFF,
New Mexico Institute of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W76-03355

LAND-USE CHANGE AND THE WATER BALANCE--AN EXAMPLE OF AN EVAPOTRANSPIRATION SIMULATION MODEL,
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2D.
W76-03359

A NOTE OF CONVECTIVE PRECIPITATION IN NUMERICAL MODELS,
Indian Inst. of Science, Bangalore.
For primary bibliographic entry see Field 2B.
W76-03372

SIMULATION OF THE RAINFALL-RUNOFF PROCESS USING A HYSTERETIC INFILTRATION-REDISTRIBUTION MODEL,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2G.
W76-03451

2B. Precipitation

HANDBOOK OF APPLIED WEATHER MODIFICATION, PART 1. COLD CLOUD MODIFICATION SUBSYSTEM, VOLUME 1. CUMULUS CLOUD TREATMENT.
Naval Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 3B.
W76-03101

METEOROLOGICAL AND HYDROLOGICAL DATA REQUIRED IN PLANNING THE DEVELOPMENT OF WATER RESOURCES (PLANNING AND DESIGN LEVEL),
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 4A.
W76-03103

AN EVALUATION OF WEATHER MODIFICATION ACTIVITIES IN THE TEXAS HIGH PLAINS,
Texas A and M Univ., College Station. Center for Applied Geosciences.
For primary bibliographic entry see Field 3B.
W76-03104

A NUMERICAL DETERMINATION OF THE EFFICIENCY WITH WHICH ELECTRICALLY CHARGED CLOUD DROPS AND SMALL RAINDROS COLLIDE WITH ELECTRICALLY CHARGED SPHERICAL PARTICLES OF VARIOUS DENSITIES,
California Univ., Los Angeles. Dept. of Meteorology.
S. N. Grover, and K. V. Beard.
Journal of the Atmospheric Sciences, Vol 32, No 11, p 2156-2165, November 1975. 7 fig, 2 tab, 19 ref, 2 append.

Descriptors: *Drops(Fluids), *Cloud physics, *Model studies, Mathematical models, Particle size, Particle shape, Raindrops, Clouds, Reynolds number, Electrical studies, Electrical conductance, Rainfall, Meteorology.
Identifiers: *Collision efficiency, Charged drops, Charged particles, Electrostatic forces.

Numerical computations were carried out to determine the efficiency with which electrically charged cloud drops and small raindrops of diameters ranging from 84 to 866 micrometers collide with electrically charged particles of densities between 1 and 4 g/cc and diameters between 0.4 and 20 micrometers. For this purpose, numerical flow fields about rigid spheres of Reynolds numbers 1, 10, 20, 100 and 200 were used to integrate the trajectory of the particle relative to the collector drop. Two approximate methods were used to represent the electrostatic force between the drop and the particle, and the resulting collision efficiencies showed that the representation of the drop and particle by two point charges is a sufficient approximation of the electrostatic fource for the majority of atmospheric charges , as long as the drop diameter is larger than 208 micrometers. For typical charges on drops and particles observed in the atmosphere, and for attractive electrostatic forces, the collision efficiency results for particles smaller than 2 micrometers in diameter showed a significant increase over the collision efficiencies for the case of no electric charges. (Sims-ISWS)
W76-03108

THE EFFECT OF ELECTRICAL CONDUCTIVITY ON THE GROWTH OF THE ELECTRIC FIELD IN A THUNDERSTORM,
Tel-Aviv Univ. (Israel). Dept. of Environmental Sciences.
Z. Levin, and W. D. Scott.
Tellus, Vol 27, No 5, p 497-506, 1975. 5 fig, 2 tab, 27 ref.

Descriptors: *Thunderstorms, *Electric fields, *Electrical conductance, *Cloud physics, Electrical properties, Clouds, Precipitation(Atmospheric), Rainfall, Atmosphere, Model studies, Mathematical models, Drops(Fluids), Raindrops, Meteorology.

The effect of the electrical conductivity on the electrical development of the cloud was investigated. By the use of a numerical model which couples the growth of the electric field and the precipitation development, it was demonstrated that as long as the conductivity varies between values which are smaller than the fair weather conductivity and values of up to 100 times the fair weather conductivity, the polarization charging mechanism is powerful enough to generate fields large enough to create lightning. (Sims-ISWS)

W76-03113

SEASONAL VARIABILITY OF RAINWATER REDISTRIBUTION BY FIELD SOILS,
Birkbeck Coll., London (England).
For primary bibliographic entry see Field 2G.
W76-03131

MONTHLY WINTER SNOWLINE VARIATION IN THE NORTHERN HEMISPHERE FROM SATELLITE RECORDS, 1966-75,
National Environmental Satellite Service, Washington, D.c.
For primary bibliographic entry see Field 2C.
W76-03180

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF NORTH CAROLINA, NORTH OF CAPE LOOKOUT,
National Weather Service, Silver Spring, Md.
F. P. Ho, and R. J. Tracey.
Available from the National Technical Information Service, Springfield, Va 22161. NOAA Technical Memorandum NWS HYDRO-27, November 1975. 46 p, 17 fig, 6 tab, 29 ref.

Descriptors: *Hurricanes, *Storms, *Storm surge, Coasts, Floods, Climatology, Tropical cyclones, Storm structure, Tidal effects, Tidal waters, *North Carolina, Land use, Management.
Identifiers: *Storm tide frequency, *Storm tides, *Tide frequencies, *Cape Lookout(NC), Storm surge model, Tidal gages, Coastal floods, Hurricane tracks, Storm tracks.

Storm tide height frequency distribution are developed on the coast of North Carolina, north of Cape Lookout, for the National Flood Insurance Program. Storm tides are computed from a full set of climatologically representative hurricane using the National Weather Service numerical-dynamic storm surge model. Winter storm effects are estimated from tide gage records. Storm tide levels from all storms are shown in coastal profile between annual frequencies of 0.10 and .002. This report is intended for use in estimating acturial risk to buildings from coastal floods and in land use management. (NOAA)
W76-03181

MOISTURE SOURCE FOR THREE EXTREME LOCAL RAINFALLS IN THE SOUTHERN INTERMOUNTAIN REGION,
National Weather Service, Silver Spring, Md.
E. M. Hansen.
Available from the National Technical Information Service, Springfield, Va 22161. NOAA Technical Memorandum NWS HYDRO-26, November 1975. 57 p, 33 fig, 3 tab, 24 ref.

Descriptors: *Rainfall, *Rainfall disposition, *Rainfall intensity, *Local precipitation, *Water sources, *Moisture, Weather patterns, Storms, Precipitation(Atmospheric), Weather data, Tropical regions, Climalogy, Synoptic analysis, Southwest U.S.
Identifiers: *Moisture sources(Atmospheric), Local rainfall, Southern U.S. intermountain regions, Rainfall studies, Synoptic data, High moisture levels, Moisture levels, Tropical moisture, Summer precipitation, Weather maps, Storm studies.

Three cases of extreme local precipitation within the Intermountain summer season were studied to determine the source of moisture for these events. Synoptic data were used to analyze surface and upper level moisture changes in time and space. In each case the study showed that a tongue of high moisture at low levels approached the vicinity of or encompassed the storm area prior to onset of the rain. The tongue of moisture was very narrow in reaching toward the Elko and Morgan storms and could be traced, through continuity of changes in pattern with time, back to the Gulf of California. The moisture is believed to be conveyed through the natural channel provided by the Gulf and the paralleling ridges. The low-level moisture followed a path controlled to some extent by major mountain barriers. A general conclusion is that greater emphasis should be given to tropical Pacific moisture in evaluating extreme summer precipitation values for the Intermountain region. (NOAA)
W76-03182

ANNOTATED BIBLIOGRAPHY OF NOAA PUBLICATIONS OF HYDROMETEOROLOGICAL INTEREST,
National Oceanic and Atmospheric Administration, Washington, D.C.
J. F. Miller.
Available from the National Technical Information Service, Springfield, Va 22161. NOAA Technical Memorandum NWS HYDRO-22, May 1975, 50 p.

Descriptors: *Bibliographies, *Publications, *Meteorology, *Meteorological data, *Hydrology, Precipitation(Atmospheric), Climatic data, Climatology, Rainfall, Weather data, Evaporation, Storms, Clouds, Flood data.
Identifiers: *Annotated bibliography, Relative humidity, Precipitable water, Climatological observations, Weather observations.

This is a bibliography of NOAA publications that have some hydrometeorological interest. It is intended to provide the engineer or hydrologist with a summary of that information published by NOAA. This bibliography is not intended to be a comprehensive listing of everything that has been published by NOAA scientists in the field of hydrometeorology. The material listed in this publication lists relevant publications prepared by NOAA in the past 20 years. As may be recognized, a good many of these publications are out of print. Certainly a portion of the research results in some of these reports have been invalidated by later investigations. They are listed because they may provide the only source for some useful information or because they provide valuable background information on various topics.(NOAA)
W76-03183

STUDIES OF SELECTED PRECIPITATION CASES FROM METROMEX.
Illinois State Water Survey, Urbana.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 669, $10.00 in paper copy, $2.25 in microfiche. Report of Investigation 81, 1975. 329 p, 251 fig, 23 tab, 66 ref. Changnon, S.A., and Semonin, R.G., Editors. NSF GI-38317, GI-38329, GI-39213; ERDA AEC-1199.

Descriptors: *Rainfall, *Cities, *Chemistry of precipitation, Storms, Thunderstorms, Rainfall disposition, Boundary layers, Cloud physics, Weather modification, Air pollution, Networks, Measurement, Radar, Precipitation(Atmospheric), Climatology, Meteorology, Missouri.
Identifiers: *St. Louis(Mo), *METROMEX.

In the analysis of METROMEX field data, 9 rain periods (case days) in 1972 and 1973 were chosen for in-depth investigations to better define the urban-related mechanisms that cause the summer rainfall in and east of St. Louis and Wood River to be greater than that in surrounding areas. The 9 cases were selected to represent a variety of summer precipitation conditions in the St. Louis area. These investigations identified several urban-related conditions that contributed to the observed precipitation alterations. Principal findings were that the urban areas: (1) initiated and thus increased the number of raincells; (2) intensified rain and severe weather from the urban-initiated cells by their subsequent merger with each other or a later system; (3) intensified rain and severe weather from existing cells passing over the urban areas by the effect of their heat, moisture, and/or aerosol plumes; (4) produced these effects only when rain-conducive synoptic conditions existed; and (5) operated with a 'domino' effect in which urban cells beget more urban cells on the same day and tend to reinforce developments in a multi-day sequence in the same locale. The case studies also revealed missing or inadequate measurements critical for METROMEX or other field projects and provided guidance for direction of the research. (Sims-ISWS)
W76-03353

SECULAR CHANGES IN SOUTH AFRICA RAINFALL: 1880 TO 1972,
University of the Witwatersrand, Johannesburg (South Africa).
P. D. Tyson, T. G. J. Dyer, and M. N. Mametse.
Quarterly Journal of the Royal Meteorological Society, Vol 101, No 430, p 817-833, October 1975. 13 fig, 2 tab, 47 ref.

Descriptors: *Climates, *Precipitation(Atmospheric), *Rainfall, Africa, Statistical methods, Fourier analysis, Mathematical studies, Numerical analysis, *Time series analysis, Cycles, Meteorological data, Seasonal, Droughts, Wet seasons, Variability.
Identifiers: *South Africa, Annual rainfall series, Trend analysis, Serial correlation, Spectral analysis, Serial analysis, Mathematical filtering, Oscillations.

Analysis of time series for 157 stations with records covering the period 1910-1972 and for fewer stations with records extending back to 1880 suggested that the commonly held view that South Africa, as a whole, is undergoing progressive desiccation must be questioned. Instead the data suggested the specific regional occurence of weak (but nonetheless readily discernible) oscillations of 16-20 and 10-12 years, the ubiquity of 3-4 year fluctuations, and the spatially distinctive occurrence of a quasi-biennial oscillation. (Jones-ISWS)
W76-03367

THE ASSIGNMENT OF RAINFALL STATIONS INTO HOMOGENEOUS GROUPS: AN APPLICATION OF PRINCIPAL COMPONENT ANALYSIS,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
T. G. J. Dyer.
Quarterly Journal of the Royal Meteorological Society, Vol 101, No 430, p 1005-1013, October 1975. 7 fig, 2 tab, 12 ref.

Descriptors: *Rainfall, *Precipitation(Atmospheric), *Statistical methods, *Forecasting, Africa, Model studies, Stochastic processes.
Identifiers: *Eigenvectors, *South Africa, *Eigenvalues, Annual precipitation, *Principal component analysis, Stochastic models.

The calculation of eigenvectors has been used to describe annual precipitation totals over an area of large extent. Rotation of the eigenvectors brought about further clarification of the system of recording stations. By noting the eigenvector of most importance to each station, delimitation of an area was made possible. Reduction in records, a necessary prelude to future work on forecasting models, was obtained by discarding those stations most closely related to eigenvectors whose eigenvalue was less than 0.6. (Jones-ISWS)
W76-03368

A NOTE OF CONVECTIVE PRECIPITATION IN NUMERICAL MODELS,
Indian Inst. of Science, Bangalore.
M. S. Rao.
Indian Journal of Meteorology and Geophysics, Vol 25, No 1, p 47-50, January 1974. 1 fig, 1 tab, 4 ref.

Descriptors: *Numerical analysis, *Rainfall, *Convection, Radiosondes, Entrainment, Model studies.
Identifiers: *Numerical modeling, *Convective precipitation.

With the help of the observed radiosonde and convective rainfall data for two Indian stations, the methods Kuo, Arakawa, and the convective adjustment method of computing convective rainfall in numerical models were compared. It was found that the rainfall computed by all three methods is comparable to the observed rainfall. However, computed rainfall differes considerably from one method to another. (Jones-ISWS)
W76-03372

COMPARATIVE STUDY OF SHOWALTER'S STABILITY INDEX AND GEORGE'S INSTABILITY VALUE K FOR PREDICTING LOCAL THUNDERSTORM OVER CALCUTTA AIRPORT,
Meteorological Office, Calcutta (India).
G. Singh, and C. L. Agnihotri.
Indian Journal of Meteorology and Geophysics, Vol 25, No 1, p 51-54, January 1974. 2 fig, 2 tab, 8 ref.

Descriptors: *Forecasting, *Thunderstorms, Convection, Stability, Radiosondes, Meteorology.
Identifiers: *Calcutta(India), Instability, Convergence, Divergence, Indices.

Showalter's stability index and George's instability value K have been calculated for 1200 observations of pre-monsoon months of Calcutta Airport. The results show that George's instability value K gives a better indication for occurrence or non-occurrence of a thunderstorm than Showalter's stability index. It has also been found that if the value of George's instability index works out to be 28 or less in the morning or evening radiosonde observation (which happens on about 48% of the total occasions) non-occurrence of a thunderstorm over Calcutta Airport during the next 15 hours can be predicted with reasonable certainty. (Jones-ISWS)
W76-03373

PB-210 IN PRECIPITATION IN JAPAN AND ITS IMPLICATION FOR TRANSPORT OF CONTINENTAL AERSOLS ACROSS THE OCEAN,
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries; and Hokkaido Univ., Sapporo (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-03385

THE PROBABILITY OF HAIL WITHIN A SPECIFIED AREA,
National Physical Research Lab., Pretoria (South Africa).
A. E. Carte.
Journal of the Atmospheric Sciences, Vol 32, No 4, p 866-868, April 1974. 3 fig, 3 ref.

Descriptors: *Hail, *Probability, Protection, Cloud seeding, Mathematical studies.
Identifiers: *Hailfalls, Hail protection, Hailstreaks, Hail suppression.

A method was given for deriving the probability that a circular hail area within a certain 'operational' area will fall on an inner area. Results were very similar to those calculated by Magaziner and Weickmann for straight-line hailstreaks. Families of curves were shown for both hail areas which fall partially within the protected area and those that fall wholly within the protected area. (Jones-ISWS)
W76-03386

2C. Snow, Ice, and Frost

WINTER SOIL WATER DYNAMICS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2G.
W76-03002

SEASONAL CHARACTERISTICS OF WATER MASSES IN MUIR INLET, A FJORD WITH TIDEWATER GLACIERS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W76-03112

EFFECTS OF LARGE THERMAL DISCHARGES ON ICE-COVERED RIVERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5C.
W76-03139

STRUCTURE AND PROPERTIES OF ICE LENSES IN FROZEN GROUND,
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 708, $4.00 in paper copy, $2.25 in microfiche. Scientific Report UAG R-233, February 1975. 30 p, 12 fig, 14 ref. OWRT C-4049(9010)(1).

Descriptors: *Permafrost, *Frozen ground, *Ice, *Arctic, Frost, Ice, Crystals, On-site investigations, Cold regions.
Identifiers: *Ice lenses.

A diamond wire saw was modified for cutting thin sections of frozen soil and suitable operating conditions were determined experimentally. A lubricated wire, 0.34 mm in diameter, operated at cutting speeds less than 30 cm/sec and cutting forces less than 100 g produced smooth cut surfaces on thin sections 0.4-0.5 mm in thickness. The temperature and wire size were not critical operating parameters and the wire tensions recommended by the manufacturer were satisfactory. A technique for mounting, photographing and storing the thin sections was described. More than 50 thin sections were cut from several frozen ground cores. Ice lenses in a well-drained silt were few in number and formed as filaments or small platelets. Ice lenses in a sandy clayish loam were numerous and formed as thin platelets. The ice crystals in these ice lenses were elongated in the vertical direction with nearly vertical crystal boundaries extending from one side of the lenses to the other. The possible flux of water through the ice lenses in frozen soil near the melting point was estimated to be about 1 cm/day. (Sims-ISWS)
W76-03140

MONTHLY WINTER SNOWLINE VARIATION IN THE NORTHERN HEMISPHERE FROM SATELLITE RECORDS, 1966-75,
National Environmental Satellite Service, Washington, D.c.
D. R. Wiesnet, and M. Matson.
Available from National Technical Information Service, Springfield, Va 22161 NOAA Technical Memorandum NESS 74, November 1975. 21 p, 12 fig, 1 tab, 8 ref.

Descriptors: *Snow cover, *Snow, *Satellites(Artificial), Snow surveys, Snowfall, Weather, Ice, Meteorology, Weather forecasting, Albedo, Hydrology.
Identifiers: *Snowline variation, *Satellite records, *Satellite imagery, *Hemispheric snow cover, Global temperature, Weather satellites, Meteorological satellites, Northern Hemisphere, Weather maps.

The application of satellite imagery for detecting, measuring, and mapping mean monthly winter snow cover over the Northern Hemisphere is demonstrated. Maps and graphs are used to depict snow cover for North America, Eurasia, and the Northern Hemisphere for the months of December through March for the period 1966-75. Although snow cover over North America tended to be fairly uniform during the 9-year period, over Eurasia and the Northern Hemisphere a cyclical pattern is evident. This satellite record of the past 9 years is the most complete record of hemispheric snow cover available. NOAA satellites provide a reliable means of monitoring worldwide snow cover, which has important effects on global temperature and albedo, with attendant impact on hydrology, agriculture, and weather forecasting. (NOAA)
W76-03180

APPLICATION OF REMOTE-SENSING TECHNIQUES TO THE STUDY OF SEASONAL SNOW COVER,
Geological Survey, Tacoma, Wash.
M. F. Meier.
Journal of Glaciology, Vol 15, No 73, p 251-265, 1975. 9 fig, 34 ref.

Descriptors: *Remote sensing, *Snow cover, *Snow surveys, *Electromagnetic waves, *Radiation, Methodology, Analytical techniques, Aerial photography, Satellites(Artificial), Meteorological data, Evaluation.

This paper discusses the measurement of important snow properties using electromagnetic radiation. Snow areal extent can be measured using manual, optical, electronic, or digital techniques from data supplied by visible and near-visible light sensors carried on Earth resources and meteorological satellites, but these techniques cannot routinely detect snow under clouds or a forest canopy. Gamma-ray techniques used at stations or from low-flying aircraft permit measurement of water equivalent of snow (depth times density). Active or passive microwave systems may permit this to be done over larger areas, but the physics of this possible technique is not yet sufficiently understood. Wetness or temperature of a snow surfaces is measurable with thermal infrared radiometers; wetness throughout a snow pack may be measurable with microwave radiometers. Much research needs to be done on the electrical (including scattering) properties of snow before efficient, all-weather, remote-sensing systems can be designed. (Woodard-USGS)
W76-03389

GLACIER APPLICATIONS OF ERTS IMAGERY,
Geological Survey, Tacoma, Wash.
R. M. Krimmel, and M. F. Meier.
Journal of Glaciology, Vol 15, No 73, p 391-402, 1975. 11 fig, 4 ref.

Descriptors: *Glaciology, *Remote sensing, *Aerial photography, *Satellites(Artificial), Meteorological data, Snow cover, Glaciers, Movement, Photogrammetry, Infrared radiation.

The ERTS satellite scanners have continued to relay images to Earth from the launch on 23 July 1972 to the present (summer 1974). Images from four spectral bands with ground resolution of about 100 m, cover an area 185 km on a side. The resulting images have proved to be very useful for collecting certain basic data from glaciers. Long-term surface velocities are readily determined by comparison of recent ERTS images with maps that have been produced from earlier data. Images have been used to measure velocities on the Malaspina Glacier over a 10 year period, surge displacements on the Lowell, Tenas Tilke, and Tweeksmuir Glaciers and Lednik Medvezhiy, and velocity at the margin of the Hubbard Glacier. Many surging glaciers are readily identifiable in

the images. Coverage from the satellite will allow surging glaciers to be identified world-wide which may help glaciologists to understand their peculiar geographical distribution. Images of large glaciers taken under conditions of low sun angle and complete snow cover show previously undetected subtle slope changes which can be interpreted as dynamic flow features or reflections of subglacial topography. ERTS imagery is providing new glacier data for several reasons: very large areas are covered repetitively with sufficient consistency to show subtle tonal changes, conditions of maximum and minimum snow cover, subtle morphologic features at low sun angle, and changes in position of glaciers. (Woodard-USGS)
W76-03390

NEW WAYS TO MONITOR THE MASS AND AREAL EXTENT OF SNOW COVER,
Geological Survey, Tacoma, Wash.
M. F. Meier.
Reprint from Proceedings of Symposium on Approaches to Earth Survey Problems through Use of Space Techniques, held in Constance, Germany, May 23-25, 1973: Committee on Space Research (of the International Council of Scientific Unions) COSPAR, p 241-250, 1974. 3 fig, 37 ref.

Descriptors: *Remote sensing, *Snow cover, *Aerial photography, *Microwaves, Aircraft, Methodology, Analytical techniques, Water equivalent, Planning, Monitoring, Evaluation, Cloud cover.

ERTS-type satellites represent a great step forward in measuring snow cover, but systems employing only visible or infrared sensors are seriously limited by cloud cover and vegetation and provide no data from below the surface of the snow. Thus microwave or radio wavelength sensors are required. Active systems are now used from aircraft to measure the thickness and internal structure of polar ice sheets. Passive microwave emission techniques appear to offer the potential of continuous monitoring of snowcovered area, snow wetness, and possibly snow water equivalent. (Woodard-USGS)
W76-03391

2D. Evaporation and Transpiration

LAND-USE CHANGE AND THE WATER BALANCE--AN EXAMPLE OF AN EVAPOTRANSPIRATION SIMULATION MODEL,
Otago Univ., Dunedin (New Zealand). Dept. of Geography.
B. B. Fitzharris.
Journal of Hydrology (New Zealand), Vol 13, No 2, p 98-114, 1974. 7 fig, 15 ref.

Descriptors: *Land use, *Water balance, *Evapotranspiration, *Simulation analysis, Runoff, Albedo, Pastures, Model studies, Vegetation, Coniferous trees, Latent heat, Numerical analysis, Climatic data.
Identifiers: *Land-use change, *New Zealand, *Alexandra(New Zealand), Coniferous forest, Flux density, Bowen ration.

Land-use change in New Zealand may have altered runoff, because of changes in evapotranspiration. The effects of changing albedo, surface roughness, and supply of water on evapotranspiration were simulated with the Myrup numerical model of the energy balance. The model was applied to a hypothetical example in Central Otago, where a scrub/tussock area was converted to improved pasture. Investigation of the model over a wider range of conditions indicated that a change from low vegetation with an albedo of 0.35 to young coniferous forest increased the daily potential evapotranspiration by about 75 percent. Differences between land-use types tended to be reduced as soil water deficit increased. The behavior of the model on an annual basis was illustrated for climatological data for Alexandra. The simulated results needed to be confirmed by actual measurements of evapotranspiration, but use of the model did have several advantages. (Roberts-ISWS)
W76-03359

AN ESTIMATE OF TOTAL SURFACE AREA OF VEGETATION FOR PUKEITI CATCHMENT, NORTHLAND, NEW ZEALAND,
Ministry of Works and Development, Nelson (New Zealand).
For primary bibliographic entry see Field 4D.
W76-03360

EVAPORATION FROM LAKE ERIE,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environment Research Labs.
J. A. Derecki.
Available from Superintendent of Documents, C55.13:ERL 342-GLERL 3 US Government Printing Office Washington, DC 20402. NOAA Technical Report ERL 342-GLERL 3, June 1975, 92 p.

Descriptors: *Evaporation, *Water levels, *Water loss, *Evaporimeters, Lake Erie, Condensation, Energy budget, Air-water interfaces, Meteorological data, Water vapor, Measurement, Great lakes, Lakes, Humidity, Hydrologic budget, Bodies of water.
Identifiers: *Lake evaporation, *Lake levels, *Lake Erie evaporation, Two mass transfer.

The monthly evaporation from Lake Erie was derived by the water budget, two mass transfer, energy budget, and two combined mass transfer-energy budget equations. The period of record varies with the availability of data, from 32 years for the water budget and mass transfer methods to 17 years for the other methods. Evaporation determined by a single method is not sufficiently reliable and requires verification of accuracy by different methods. Only the water budget method determines evaporation directly, as a residual from other measurements, and it was used as a control for other estimates of evaporation. The overall analysis of results indicates that reasonably accurate evaporation estimates during the year can be obtained by the water budget and the modified Lake Hefner mass transfer equations, and during the high evaporation season by the energy budget equation. The combined mass transfer-energy budge equations produced evaporation estimates which are considered to be of much lower accuracy. (NOAA)
W76-03415

2E. Streamflow and Runoff

METEOROLOGICAL AND HYDROLOGICAL DATA REQUIRED IN PLANNING THE DEVELOPMENT OF WATER RESOURCES (PLANNING AND DESIGN LEVEL),
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 4A.
W76-03103

FLOW FORECASTING FOR THE BULL RUN WATERSHED,
Multinomah County Div. of Planning and Development, Portland, Oreg.
For primary bibliographic entry see Field 4D.
W76-03109

EFFECT OF SEPARATION ANGLE ON VORTEX STREETS,
Durham Univ., (England). Dept. of Engineering Science.
For primary bibliographic entry see Field 8B.
W76-03116

HEAT ASSIMILATIVE CAPACITY OF THE SANGAMON RIVER,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5B.
W76-03142

INTERVENTION ANALYSIS IN WATER RESOURCES,
Waterloo Univ., (Ontario). Dept. of Civil Engineering.
K. W. Hipel, W. C. Lennox, T. E. Unny, and A. I. McLeod.
Water Resources Research, Vol 11, No 6, p 855-861, December 1975. 3 fig, 1 tab, 25 equ, 10 ref.

Descriptors: *Water resources, *Stochastic processes, *Time series analysis, *Hydrology, River flow, Dams, Projects, Reservoirs, Estimating, Water quality, Annual, Control, Mathematical models, Systems analysis, Equations.
Identifiers: *Intervention analysis, Nile River(Africa), Aswan(Egypt), Noise component, Box-Jenkins transfer function models.

Intervention analysis is a stochastic transfer function modeling technique to investigate rigorously whether or not a natural or man-induced intervention causes a significant change in the mean level of a time series. Many types of man-made or natural interventions occur in natural hydrologic phenomena. In order to use an observed hydrologic time series as a reliable input to the system design and operation of a water resource project, it is necessary to be able to model the time series accurately. Intervention analysis is a viable technique to model correctly a hydrologic time series and account accurately for any external influences affecting that series. The mathematics of intervention analysis is presented followed by a systematic method of analysis that is used to study the effect of the Aswan dam on the average annual flows of the Nile River. The analysis shows that a significant drop in the flow occurred in 1903 when the dam was brought into operation. Transfer function parameter estimates statistically describe the intervention effect while the stochastic intervention model developed can be used for forecasting and simulation. It is maintained that the potential of intervention analysis in water resources is extensive. (Bell-Cornell)
W76-03165

HYDROLOGY AND CIRCULATION PATTERNS IN THE VICINITY OF OREGON INLET AND ROANOKE ISLAND, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Geosciences.
J. J. Singer, and C. E. Knowles.
Report, UNC-SG-75-15, June 1975. 171 p, 38 fig, 8 tab. NOAA Grant 04-3-158-40.

Descriptors: Hydrology, *Flow, *River flow, *Streamflow, Hydrologic data, Floods, Hydrography, On-site data collections, Currents(Water), Circulation, Flow duration, Thermal properties, Hypolimnion, Wind velocity, Upwelling, *North Carolina.
Identifiers: *Circulation patterns, *Oregon Inlet(NC), *Roanoke Island(NC), Thermographic data, Bottom waters, Ebbs, Wind reversals, Oceanic upwelling, Water salinity, Sea Grant Program.

The hydrology and circulation data compiled in the study encompassed three major areas of interest. These included flow in Roanoke and Croatan Sounds, the influences of wind on ebb and flood at Oregon Inlet, and thermographic data collected at Oregon Inlet. The flow of bottom waters in Croatan Sound and in mid-Roanoke Sound was observed to be essentially a direct response to the prevailing winds, except where the winds had prevailed for in excess of 24 to 36 hours causing pileup and subsequent flow reversal. In north Roanoke Sound, the flow of bottom waters south during northerly winds was observed to be essen-

tially non-existent. In south Roanoke Sound, the flow was observed to be influenced by both the winds and flood tides at the inlet. In conjunction with this interaction in south Roanoke Sound, a mechanism was proposed for the northerly penetration of high salinity waters northward through Roanoke Sound towards Albemarle Sound. Both extended ebbs (missed floods) and extended floods (missed ebbs) were recorded at Oregon Inlet. The initiation of these events was observed to be not nearly so dependent on long durations of high wind speeds as previously thought. In fact, rapid wind reversals were noted as apparently enhancing the likelihood of such events. (NOAA)
W76-03178

RUNOFF MEASUREMENT IN SMALL CATCHMENT AREAS: REGISTRATION AND PRESENTATION OF DATA, (IN NORWEGIAN),
Norges Landbrukshoegskole, Vollebekk.
O. Kaarstad.
Forsk Fors Landbruket, Suppl, p 1-102, 1972, Illus. English summary.

Descriptors: *Runoff, *Agricultural runoff, Flood discharge, *Drainage, Drains, Drainage engineering, Watersheds(Basins), *Data collections, Measurement.

Data are given on: a summary of 72 gaging stations; hours the runoff exceeded certain limits during the summer, winter and the hydraulic year; flood peaks, all numbers given as l/s ha; total runoff for the summer, winter and the hydraulic year; interruptions in the measurements. The purpose was to get basic information for hydraulic design of open and closed drainage for agriculture.--Copyright 1974, Biological Abstracts, Inc.
W76-03280

HYBRID FORMULATION OF KINEMATIC WAVE MODELS OF WATERSHED RUNOFF,
New Mexico Institute of Mining and Technology, Socorro.
V. P. Singh.
Journal of Hydrology, Vol 27, No 1/2, p 33-50, October 1975. 10 fig, 2 tab, 14 ref, 1 append.

Descriptors: *Rainfall-runoff relationships, *Overland flow, *Surface runoff, *Model studies, Watersheds(Basins), Rainfall disposition, Runoff, Hydrographs.
Identifiers: *Kinematic wave models, Analytical solutions, Numerical solutions, Hybrid approach, Watershed geometry.

In application of kinematic wave models of watershed runoff, either numerical or analytical solutions are employed, depending on type of input (rainfall pattern) and representation of basin geometry. Analytical solutions require extremely restrictive assumptions which diminish their utility; numerical solutions are less restrictive but are time-consuming. A hybrid approach, incorporating both numerical and analytical methods in the solution of a single problem, was proposed. It was demonstrated to be more efficient than a numerical approach alone, and more generally applicable than an analytical approach alone. Several existing models were evaluated and revised to correspond to the hybrid approach, and one of these revised models was used to analyze a set of rainfall-runoff events on a natural watershed as a demonstration of the computational efficiency of this approach. (Bender-ISWS)
W76-03355

REPRESENTATIVE DISCHARGES FOR GRAVEL-BED RIVERS IN ALBERTA, CANADA,
New Brunswick Univ., Fredericton. Dept. of Civil Engineering.
D. I. Bray.
Journal of Hydrology, Vol 27, No 1/2, p 143-153, October 1975. 4 fig, 3 tab, 13 ref.

Descriptors: *Discharge(Water), *Streamflow, *Channel morphology, *Channel flow, *Canada, River beds, Rivers, Geomorphology, Hydrology, Channels, Beds.
Identifiers: *Dominant discharge, *Representative discharge, *Gravel-bed rivers, Mobile-bed channel, Alberta.

Dominant discharge may be defined as the steady discharge which could form or maintain the average geometric properties of a mobile-bed channel. For practical purposes, dominant discharge may be approximated by a representative discharge based on a hydrological definition or based on the stage corresponding to an identifiable geomorphic feature. An analysis of 71 relatively stable gravel-bed river reaches in Alberta, Canada, was utilized as the basis for adopting the 2-year flood (log-normal analysis) as the representative discharge when considering a hydrologically based definition. The discharge corresponding to the elevation of the valley flat was considered to be the representative discharge for channels which are not excessively entrenched when considering a geomorphologically based definition. (Bender-ISWS)
W76-03357

ALLOMETRIC CHANGE OF LANDFORMS,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 4A.
W76-03384

HURRICANE AGNES RAINFALL AND FLOODS, JUNE-JULY 1972,
Geological Survey, Reston, Va; and National Weather Service, Silver Spring, Md.
J. F. Bailey, J. L. Patterson, and J. L. H. Paulhus.
Available from Supt of Documents, GPO, Wash, DC 20402, price $9.10. Professional Paper 924, 1975. 403 p, 59 fig, 1 plate, 8 tab, 34 ref.

Descriptors: *Hurricanes, *Floods, *Flood data, *Northeast U.S., *Southeast U.S., Reviews, Hydrologic data, Flood frequency, Flood damage, Streamflow, Rainfall, Runoff, Flow measurement, Peak discharge, Flood stages, Flood flow, Flood profiles, Flow duration, Flood recurrence interval.
Identifiers: *Hurrican Agnes(1972).

Hurricane Agnes originated in the Caribbean Sea region in mid-June 1972. Torrential rain caused record-breaking floods which occured in the Middle Atlantic States in late June and early July 1972. Many streams in the affected area experienced peak discharges several times the previous maxima of record. Estimated recurrence intervals of peak flows at many gaging stations on major rivers and their tributaries exceeded 100 years. The suspended-sediment concentration and load of most flooded streams were also unusually high. The widespread flooding from this storm caused Agnes to be called the most destructive hurricane in United States history, claiming 117 lives and causing damage estimated at $3.1 billion in 12 states. Damage was particularly high in New York, Pennsylvania, Maryland, and Virginia. The detailed life history of Hurricane Agnes, including the tropical depression and tropical storm stages, is traced. (Woodard-USGS)
W76-03397

THE CHANNELS AND WATERS OF THE UPPER SALMON RIVER AREA, IDAHO,
Geological Survey, Boise, Idaho.
W. W. Emmett.
Available from the Supt. of Documents, GPO, Wash., DC 20402, Price $3.05.

Descriptors: *Hydrologic data, *Streamflow, *Water quality, *Natural streams, *Idaho, Geology, Topography, Climates, Vegetation, Land use, Gaging stations, Runoff, Channel morphology, Flow characteristics, Water resources, Peak discharge, Low flow, Average flow, Sediment transport, Water temperature, Chemical properties.
Identifiers: *Upper Salmon River area(Idaho), Bankful.

The upper 1,800 sq mi of the Salmon River drainage area in south-central Idaho has a little disturbed, natural environment, where for the most part the surface waters are in a pristine state. The magnitude of high- and low-flow stream characteristics is presented in terms of the ratio of discharge to bankful discharge, and the frequency and duration characteristics of these flows are approximately the same for all streams in the area. A recurrence interval of 2 years implies a normal or median year; that is, half the years should produce higher flow, and the remainder should produce lower flow. The median year will have a peak streamflow of about 120 percent of bankful discharge. Likewise, this median year should have 30 consecutive days with a mean discharge of 90 percent or more of bankful and 90 consecutive days with a mean discharge of 60 percent or more of bankful. Conversely, in the low-flow season, the median year should have 30 consecutive days with a mean discharge of 8.2 percent or less of bankful and 90 consecutive days with a mean discharge of 9.0 percent or less of bankful. Stream waters are mostly calcium bicarbonate, and the waters generally are of high quality. (Woodard-USGS)
W76-03405

GUIDELINES FOR FLASH FLOOD AND SMALL TRIBUTARY FLOOD PREDICTION,
National Weather Service Forecast Office, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-03417

WAVE TRANSFORMATIONS OVER A SLOPING BOTTOM AND OVER A THREE-DIMENSTIONAL SHOAL,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W76-03421

2F. Groundwater

ECONOMIC EFFECTS OF LAND SUBSIDENCE DUE TO EXCESSIVE GROUNDWATER WITHDRAWAL IN THE TEXAS GULF COAST AREA,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4B.
W76-03099

AQUIFER EVALUATION USING DEPOSITIONAL SYSTEMS: AN EXAMPLES IN NORTH-CENTRAL TEXAS,
Dames and Moore, Boca Raton, Fla.
W. D. Hall, and L. J. Turk.
Ground Water, Vol 13, No 6, p 472-483, November-December 1975. 14 fig, 3 tab, 18 ref.

Descriptors: *Aquifer systems, *Geohydrologic units, *Water quality, *Hydrogeology, *Texas, Sandstones, Geochemistry, Water resources, Aquifer characteristics, Transmissivity, Groundwater, Hydraulic conductivity, Permeability, Facies(Sedimentary) Geologic formations.
Identifiers: *Depositional system, *Chemical composition, Hosston sandstone, Hensel sandstone.

Delineation of major depositional systems and their component facies within the Lower Cretaceous Hosston and Hensel Sandstones provides a model for predicting the distribution and chemical composition of water in the aquifer. Two major depositional trends occur in the Hosston Formation: (1) a dip-oriented meanderbelt fluvial

system which supplied sediment to (2) a strike-oriented, hightdestructive, wave-dominated delta system in the east. The Hensel deposits prograded eastward across the featureless upper surface of the Pearsall Formation, forming two depositional systems similar to those of the Hosston . The meanderbelt sandstone facies of the fluvial systems and the coastal barrier facies of the delta systems are capable of supplying greater amounts of groundwater than the floodbasin, lagoon-marsh-embayment, or prodelta/shelf facies. Groundwater is dominantly of the calcium-magnesium bicarbonate type in the fluvial systems but changes downdip to sodium sulfate and sodium bicarbonate types in the delta systems. The change in chemical equilibrium probably occurs as domomite-rich waters from the fluvial facies percolate downdip and dissolve anhydrite or oxidize pyrite in lagoonal facies within the delta system, and calcium may be exchanged for sodium on the marine clays. (Sanderson-ISWS)
W76-03111

DETERMINING OPTIMAL WELL DISCHARGE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4B.
W76-03118

A STOCHASTIC-CONCEPTUAL ANALYSIS OF ONE-DIMENSIONAL GROUNDWATER FLOW IN NONUNIFORM HOMOGENEOUS MEDIA,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
R. A. Freeze.
Water Resources Research, Vol 11, No 5, p 725-741, October 1975. 19 fig, 1 tab, 37 ref.

Descriptors: *Stochastic processes, *Groundwater movement, *Non-uniform flow, *Statistical models, Homogeneity, Porous media, Monte Carlo method, Saturated flow, Parametric hydrology, Hydraulic conductivity, Compressibility, Porosity, Distribution patterns, Spatial distribution, Aquifer characteristics, Correlation analysis, Aquifers, Consolidation, Steady flow, Unsteady flow.
Identifiers: One-dimensional flow, Mean, Standard deviation, Boundary value problems, Hydraulic head, Equivalent aquifer.

The most realistic representation of a naturally occurring porous medium is a stochastic set of macroscopic elements in which the values of the three basic parameters (hydraulic conductivity, compressibility, and porosity) are defined by frequency distribution. All soils and geologic formations show random variations in the values of these parameters through space, and a measure of the nonuniformity is provided by the standard deviation of the frequency distributions. The analysis of groundwater flow in nonuniform media requires a stochastic-conceptual approach in which the effects of stochastic parameter distributions on predicted hydralic heads are analyzed with the aid of a set of Monte Carlo solutions to the pertinent boundary value problems. In this study, two one-dimensional saturated flow problems were analyzed: steady state flow between two specified heads and transient consolidation of a clay layer. The primary output was the statistical distribution of hydraulic head. Results showed that the standard deviations of the input hydrogeologic parameters are important index properties. For transient flow, the output distribution of hydraulic head values is almost never normal. The results of the study questioned the validity of the underlying assumption of deterministic groundwater modelling that a single value for each flow parameter can define an 'equivalent' uniform porous medium. (Visocky-ISWS)
W76-03128

THE GALERKIN METHOD FOR NONLINEAR PARABOLIC EQUATIONS OF UNSTEADY GROUNDWATER FLOW,
California Univ., Los Angeles. Dept. of Engineering Systems.
Y. S. Yoon, and W. W-G. Yeh.
Water Resources Research, Vol 11, No 5, p 751-754, October 1975. 2 fig, 15 ref.

Descriptors: *Unsteady flow, *Equations, *Groundwater movement, *Finite element analysis, Analytical techniques, Numerical analysis, Mathematical studies, Aquifers, Surface-groundwater relationships, Homogeneity, Isotropy, Water table, Specific yield, Hydraulic conductivity.
Identifiers: *Galerkin method, Newton method, Nonlinear parabolic equations, Boundary conditions, Predictor-corrector techniques, Weighting functions.

A relatively simple way was suggested for solving nonlinear parabolic partial differential equations associated with unsteady groundwater flow. The Galerkin formulation was discretized in the space domain by using piecewise polynomial equations, and the trapezoidal formula was employed to approximate the time derivative. The resulting system of nonlinear equations was then solved by the Newton method. Rapid rate of convergence and easy computer implementation were demonstrated by numerical examples. Results compared favorably with published experimental data. (Visocky-ISWS)
W76-03129

ISOTOPIC COMPOSITION OF GROUNDWATER IN SEMI-ARID REGIONS OF SOUTHERN AFRICA,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 2K.
W76-03130

ECONOMIC ASPECTS OF GEOELECTRICAL PROSPECTING IN SANDSTONE AQUIFERS,
Birmingham Univ. (England). Dept. of Geological Sciences.
For primary bibliographic entry see Field 4B.
W76-03276

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-03356

APPLICATIONS OF ELECTRO-OSMOSIS TO GROUND-WATER FLOW PROBLEMS,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
R. W. Lewis, C. Humpheson, and J. C. Bruch, Jr.
Ground Water, Vol 13, No 6, p 484-491, November-December 1975. 7 fig, 16 ref. NSF GK-42356.

Descriptors: *Electro-osmosis, *Groundwater movement, *Soil water movement, *Computer models, Confined water, Artificial recharge, Recharge wells, Water wells, Finite element analysis, Electrodes, Anodes, Cathodes, Electric fields, Numerical analysis, Groundwater, Aquifers.
Identifiers: *Confined aquifer, Electrokinetic forces, Hydrodynamic forces.

The solution of two-dimensional groundwater flow in soils of low hydraulic conductivity under the influence of both electrokinetic and hydrodynamic forces was found using the finite element method. The example investigated dealt with a confined aquifer in which there is a recharging as well as a discharging well present. The results demonstrated the effect of the application of the electro-osmosis phenomenon. The formulation is general and permits the analysis of not only arbitrary shaped boundaries but also different electrode configurations. (Sanderson-ISWS)
W76-03362

C. E. JACOB'S STUDY ON THE PROSPECTIVE AND HYPOTHETICAL FUTURE OF THE MINING OF THE GROUND WATER DEPOSITED UNDER THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4B.
W76-03363

OPTIMAL IDENTIFICATION OF PARAMETERS IN AN INHOMOGENEOUS MEDIUM WITH QUADRATIC PROGRAMMING,
California Univ., Los Angeles.
W. W-G. Yeh.
Society of Petroleum Engineers Journal, Vol 15, No 5, p 371-375, October 1975. 3 tab, 15 ref.

Descriptors: *Aquifer characteristics, *Parametric hydrology, *Model studies, *Analytical techniques, *Unsteady flow, Computer models, Mathematical models, Aquifer systems, Transmissivity, Numerical analysis, Groundwater, Equations, Groundwater basins, Groundwater movement, Flow nets.
Identifiers: Parameter identification, *Nonhomogeneous aquifers, Inverse problem, *Quadratic programming, Method of successive approximations.

This paper developed a new algorithm for parameter identification in a partial differential equation associated with an inhomogeneous aquifer system. The parameters chosen for identification were the storage coefficient, a constant, and transmissivities, functions of the space variable. An implicit finite-difference scheme was used to approximate the solutions of the governing equation. A least-squares criterion was then established. Using distributed observations on the dependent variable within the system, parameters were identified directly by solving a sequence of quadratic programming problems such that the final solution converged to the original problem. The advantages of this new algorithm include rapid rate of convergence, ability to handle any inequality constraints, and easy computer implementation. The numerical example presented demonstrated the simultaneous identification of 12 parameters in only seconds of computer time. (Prickett-ISWS)
W76-03369

AN AQUIFER MODEL FOR FISSURED RESERVOIRS,
Shell Development Co. Houston, Tex.
P. J. Closmann.
Society of Petroleum Engineers Journal, Vol 15, No 5, p 385-398, October 1975. 9 fig, 4 tab, 17 ref, 2 append.

Descriptors: *Model studies, *Fissures(Geologic), *Computer models, *Aquifers, *Numerical analysis, Fracture permeability, Equations, Mathematical models, Analytical techniques, Porosity, Fractures(Geologic), Karst hydrology, Carbonate rocks.
Identifiers: *Fissured reservoirs, Matrix permeability, Petrophysical properties, Reservoir performance, *Aquifer models.

A model was developed for describing aquifer influx in a fissured reservoir. This model included petrophysical properties of good and poor rock, as well as fissure parameters. For the applications considered thus far, it was found that flow in the fissures dominates the aquifer performance and that rock properties and spacing between fissures are of lesser importance. For a given aquifer, the

fissure permeability and fissure volume fraction appear to be important parameters, as are rock permeability and porosity in cases of a high percentage of poor rock. (Prickett-ISWS)
W76-03370

PULSE-TESTING RESPONSE FOR UNEQUAL PULSE AND SHUT-IN PERIODS,
Amoco Production Co. Tulsa, Okla.
For primary bibliographic entry see Field 4B.
W76-03371

MIXING OF THERMAL AND NONTHERMAL WATERS IN THE MARGIN OF THE RIO GRANDE RIFT, JEMEZ MOUNTAINS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2K.
W76-03393

CHEMICAL QUALITY OF GROUND WATER IN THE NORTHERN PART OF THE ALBUQUERQUE-BELEN BASIN, BERNALILLO AND SANDOVAL COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-03394

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1975,
Geological Survey, Garden Grove, Calif.
For primary bibliographic entry see Field 7C.
W76-03396

MAP SHOWING GROUND-WATER CONDITIONS IN THE WATERMAN WASH AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1975,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 7C.
W76-03399

ANALOG MODEL STUDY OF THE HYDROLOGY OF THE SAN LUIS VALLEY, SOUTH-CENTRAL COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-03403

2G. Water In Soils

HEAT AND MASS TRANSFER IN COLD REGION SOILS,
Alaska Univ., College. Inst. of Water Resources.
D. L. Kane, J. N. Luthin, and G. S. Taylor.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 457, $4.50 in paper copy, $2.25 in microfiche. Publication No IWR-65, June 1975. 50 p, 21 fig, 15 ref, 2 append. OWRT A-053-ALAS(1). 14-31-0001-5002.

Descriptors: *Soils moisture, *Permafrost, *Snow cover, *Model studies, *Heat transfer, Soil temperature, Moisture content, Pore pressures, Subarctic, Snowpack, Alaska temperature, Forest fires, Computer models, *Mass transfer, *Burning, Cold regions, Organic matter.
Identifiers: Black spruce(Picea-Mariana).

Many parts of interior Alaska have a fire-dominated environment. It has been recognized that there are many beneficial effects of fire; consequently, the past fire control philosophy has been altered. Prescribed and controlled burning are being considered under the new approach. The more intense burns occur in the black spruce (Picea-Mariana) forests which are characterized by a thick organic layer and a shallow mineral soil underlain by permafrost. From field data, it is clear that both the thermal and moisture regimes undergo considerable alteration due to a fire. The degree to which these systems are influenced depends upon many factors, primarily that of the intensity of the burn. Soil temperatures in the burned area are much higher than those in the unburned areas in both summer and winter. The impact on the soil moisture regime is not as evident as that on the thermal regime. The total moisture content is a soil column of a burned site shows a slight increase over a similar unburned site, apparently reflecting the decrease in plant transpiration. A conceptual model of the long-term effects is presented. In addition, a two-dimensional flow model is applied to saturated flow conditions in the organic layer. This organic layer acts as a buffer to both heat and moisture flow, and therefore the destruction of this layer is responsible for changes to the physical system. (See also W76-03002)
W76-03001

WINTER SOIL WATER DYNAMICS,
Alaska Univ., College. Inst. of Water Resources.
D. L. Kane.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 458, $3.50 in paper copy, $2.25 in microfiche. Publication No IWR-70, December 1975. 10 p, 3 fig. OWRT A-053-ALAS(2). 14-31-001-5002.

Descriptors: *Soil moisture, *Snow cover, *Permafrost, *Soil temperature, *Pore pressures, Snowpack temperatures, Instrumentation, Subarctic, *Soil water, *Burning, Cold regions.

This study was carried out in conjunction with another study, the objective of which was to determine the effect of fire on the near-surface thermal and soil moisture regimes. The goal of this project was to collect field data on the thermal and moisture regimes over a winter season, with emphasis on the measurement of soil pore pressures and changes in the soil moisture content. Soil tension measurements in advance of the freezing front were made on two sites, one a burned site and the other an unburned natural site, until mid-winter. Two techniques were used to measure soil tensions: one contained an antifreeze solution in the porous cup tensiometer, while the other contained water. A very rapid rise in pore pressures occurred immediately after the onset of freeze-up. Later, the difference in pore pressures at depth was such that the hydraulic gradient reversed direction. Under these conditions, soil moisture moves toward the ground surface with such movement resulting in moisture depletion during the winter. Data on the movement of soil water, as well as on the soil condition during the spring break-up, are vital to an understanding of the many engineering and hydrologic problems that develop in cold regions. (See also W76-03001)
W76-03002

TIME-DEPENDENT LINEARIZED INFILTRATION: II. LINE SOURCES,
Arizona Univ., Tucson. Dept. of Mathematics.
D. O. Lomen, and A. W. Warrick.
Soil Science Society of America Proceedings, Vol 38, No 4, p 568-572, July-August, 1974. 6 fig, 12 ref. OWRT B-035-ARIZ(3).

Descriptors: *Infiltration, *Soil water movement, *Mathematical studies, *Unsaturated flow, *Soil water, Irrigation practices, Irrigation effects, Irrigation systems, Irrigation, Agriculture, Irrigation water.
Identifiers: *Trickle irrigation, *Drip irrigation, *Transient flow.

Water flow from line sources is analyzed using a linearized form of the moisture flow equation. Both single and parallel line sources are considered. Results are particularly relevant for high-frequency irrigation such as by trickle sources, for which the soil moisture at any particular point varies over a relatively small range. Numerical calculations include lines of constant matric flux potential (or equal moisture content) as a function of time and the time-dependent response to a cyclic input. Although the results are developed for surface sources, the analysis may easily be extended to buried sources. (Skogerboe-Colorado State)
W76-03007

SOLUTION TO THE ONE-DIMENSIONAL LINEAR MOISTURE FLOW EQUATION WITH WATER EXTRACTION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. W. Warrick.
Soil Science Society of America Proceedings, Vol 38, No 4, p 573-576, July-August, 1974. 3 fig, 2 tab, 8 ref. OWRT B-035-ARIZ(4).

Descriptors: *Soil water movement, *Infiltration, *Mathematical studies, *Unsaturated flow, *Soil water, Irrigation practices, Irrigation effects, Irrigation systems, Irrigation, Agriculture, Irrigation water.
Identifiers: *Trickle irrigation, *Drip irrigation, Matrix flux potential.

The one-dimensional, steady-state moisture flow equation is solved for arbitrary plant water withdrawal functions using the matric flux potential of earlier investigators to obtain a linearized form. A semi-infinite flow medium and a finite-depth medium overlying a shallow water table are considered with the surface boundary condition taken as a flux. Tables are presented giving the matric flux potential (from which the pressure head is easily determined) for several withdrawal functions. Numerical examples show the effects of different surface fluxes and rooting depths on the matric flux potential and pressure-head profiles. The results are particularly relevant for high-frequency irrigation. (Skogerboe-Colorado State)
W76-03008

METHOD OF ESTIMATING MAXIMUM WATER-HOLDING CAPACITY IN SHALLOW SOIL IN A WATERSHED BY PORTABLE SEISMIC PROSPECTING EQUIPMENT,
A. Kikuya, Y. Mashima, and S. Hattori.
Bull Gov For Exp Stn (Tokyo), 270: 77-88, Illus, 1975.

Descriptors: Watersheds(Basins), *Estimating, Methodology, Water storage, Soils, Seismic studies, Equipment.
Identifiers: *Water holding capacity, *Seismic prospecting, *Shallow soils.

One of the important factors affecting the runoff during rainfall and immediately after rainfall is the water-holding capacity in shallow soil layer in forest watershed. This being so, a quantitative method of measuring the factor is demanded. A trial of a method for investigating soil depth and total pore space in a shallow soil layer was conducted by measuring seismic velocity by means of portable seismic prospecting equipment. The relation between dry density (rho s:g/cm3) and seismic velocity (gamma:m/s) of soil was approximately: rho s = 0.179 gamma 0.206. The formula was adopted in the case of soil water content of more than 45% in volume percent. The total pore space in shallow soil layer in a watershed was calculated applying the rho s and total soil volume, and the possibility of estimating the average maximum water-holding capacity in shallow soil layer in a watershed is indicated.--Copyright 1975, Biological Abstracts, Inc.
W76-03063

SOIL WATER HYSTERESIS: TEMPERATURE AND PRESSURE EFFECTS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.

J. W. Cary.
Soil Science, Vol 120, No 4, p 308-311, October 1975. 2 fig, 1 tab, 7 ref.

Descriptors: *Hysteresis, *Soil moisture, *Soil water, Soil gases, Soil temperature, Air-water interfaces, Microenvironment, Soil physical properties, Clay minerals, Laboratory tests, Pressure, Model studies.
Identifiers: Pore liquid jump model, Silty clay, Loamy sand, Silt loam.

The effects of transient temperatures and pressures on soil water hysteresis were studied under controlled laboratory conditions. Variations in ambient pressure and temperature caused small changes in soil water hysteresis. These changes suggested that at least two mechanisms may be present, neither of which is easily rationalized by the classical hourglass-shaped pore liquid jump model. The variation between duplicate samples of a silty clay, a silt loam, and a loamy sand suggested that normal temperature and pressure changes in the field will not cause changes in soil water hysteresis that are larger than those due to natural soil heterogeneity. Consequently, soil water hysteresis curves measured in the laboratgory on representative samples may be used in computer models of field situations. (Gibb-ISWS)
W76-03110

FLUOMETURON AND WATER CONTENT DISTRIBUTIONS DURING INFILTRATION: MEASURED AND CALCULATED,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-03123

SEASONAL VARIABILITY OF RAINWATER REDISTRIBUTION BY FIELD SOILS,
Birkbeck Coll., London (England).
I. Reid.
Journal of Hydrology, Vol 25, No 1/2, p 71-80, April 1975. 4 fig, 3 tab, 31 ref.

Descriptors: *Rainfall disposition, *Infiltration, *Soil moisture, Moisture content, Antecedent moisture content, Field capacity, Hysteresis, Soil moisture meters, Permeability, Soil-water-plant relationships, Variability, Seasonal.
Identifiers: *North Yorkshire(England).

Seasonal differences in post-infiltration redistribution of rainwater were evaluated for highly porous pasture soils. Winter soil drainage is precipitation-dependent, while soil-moisture fluctuations are a function of the relationship between antecedent soil water-content and the seasonal mean are are largely independent of infiltration quantities. Summer soil drainage is dependent upon both rainfall and differential soil absorption and was described by a linear multiple regression model. The seasonal nature of redistribution is an important consideration of catchment water disposition, and is useful as a control in the evaluation of optimal irrigation practice under field conditions. Temporal changes in soil-moisture response to rainfall exposed difficulties in the conceptualization of field capacity and soil-moisture deficit. Gibb-ISWS)
W76-03131

MOVEMENT OF HERBICIDES IN SOIL BY MASS FLOW,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 5B.
W76-03134

CONTROL OF NITROGEN TRANSFORMATIONS IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-03141

FATE OF WASTEWATER PHOSPHORUS IN SOIL,
Robert S. Kerr Environmental Research Lab., Ada, Okla. Water Quality Control Branch.
For primary bibliographic entry see Field 5B.
W76-03250

FATE OF WASTEWATER BACTERIA AND VIRSUSES IN SOIL,
Baylor Coll. of Medicine, Houston, Tex. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5B.
W76-03251

EFFECT OF FALLOUT OF WINDBRONE ZINC, LEAD, COPPER AND CADMIUM FROM A FUMING KILN ON SOIL GEOCHEMICAL PROSPECTING AT BERG AUKAS, SOUTH WEST AFRICA,
Cape Town Univ., South Africa. Dept. of Geochemistry.
For primary bibliographic entry see Field 5B.
W76-03302

GEOCHEMICAL AND BIOGEOCHEMICAL EXPLORATION RESEARCH NEAR EARLY PRECAMBRIAN PORPHYRY-TYPE MOLYBDENUM-COPPER MINERALIZATION, NORTHWESTERN ONTARIO, CANADA,
Ministry of Natural Resources, Toronto, Ontario, Canada. Ontario Division of Mines.
For primary bibliographic entry see Field 5A.
W76-03315

FACING UP TO SLUDGE DISPOSAL IN NEW JERSEY,
For primary bibliographic entry see Field 5E.
W76-03341

THE EFFECT OF TIMBER REMOVAL ON THE STABILITY OF FOREST SOILS,
Forest and Range Experiment Station, Rangiora (New Zealand). Div. of Protection Forestry.
For primary bibliographic entry see Field 4C.
W76-03361

APPLICATIONS OF ELECTRO-OSMOSIS TO GROUND-WATER FLOW PROBLEMS,
University Coll. of Swansea (Wales). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-03362

DYNAMIC SIMULATION OF WATER STORAGE IN FALLOW SOIL AS AFFECTED BY MULCH OF HYDROPHOBIC AGGREGATES,
Texas A and M. Univ., College Station. Dept. of Soil and Crop Sciences; and Texas Agricultural Experiment Station, College Station.
D. I. Hillel, C. H. M. van Bavel, and H. Talpaz.
Soil Science Society of America Proceedings, Vol 39, No 5, p 826-833, September-October 1975. 7 fig, 1 tab, 16 ref, 1 append.

Descriptors: *Dynamic programming, *Storage, *Fallowing, *Mulching, *Soil aggregates, Numerical analysis, Water balance, Cycles, Infiltration, Evaporation, Soil properties, Hydraulic properties, Rainfall intensity, Runoff, Agricultural runoff, Drainage, Moisture content, Soil moisture, Water conservation, Soil management, Water management(Applied), Crop production, Groundwater recharge, Model studies.
Identifiers: *Hydrophobic aggregates, Layers.

A mechanistic numerical model, based on fundamental physical principles and written in IBM S/360 CSMP language, was designed to compute the dynamic balance of water in a fallow soil through repeated cycles of infiltration and evaporation. The necessary inputs are: (1) hydraulic characteristics of the soil and of the surface crust of mulch layer, (2) duration and intensity characteristics of rainstorms or irrigations, and (3) the potential evaporation rate as it varies diurnally and from day to day. The output provides time-dependent rates and cumulative quantities of infiltration, runoff, surface detention, evaporation, internal drainage and changes in water content of different layers and of the profile as a whole. Computations carried out for a 4-day simulation (including two rainstorms and four evaporation cycles) illustrated the use of the model for uniform, crusted or mulched soil and predicted that the presence of a mulch of hydrophobic aggregates, several centimeters thick, can greatly increase the quantity of water absorbed and retained in the profile. This finding accorded with previously-published experimental results and indicated a promising approach to soil management for water conservation in dryland and irrigated farming. (Visocky-ISWS)
W76-03365

RELATIONSHIPS BETWEEN THE HYDRAULIC CONDUCTANCE OF SURFACE CRUSTS AND SOIL MANAGEMENT IN A TYPIC HAPLUDALF,
Soil Survey Inst., Wageningen (Netherlands).
O. Falayi, and J. Bouma.
Soil Science Society of America Proceedings, Vol 39, No 5, p 957-963, September-October 1975. 8 fig, 3 tab, 36 ref.

Descriptors: *Hydraulic conductivity, *Soil management, Runoff, Soil erosion, Cultivation, Rotations, On-site investigations, Simulated rainfall, Soil aggregates, Soil properties, Infiltration, Loam, Equipment, Storage, Pores, Corn(Field), Steady flow, Runoff.
Identifiers: *Soil crusting, Crust test, Soil roughness.

The effect of different soil management, in terms of soil tillage and crop rotation, on soil crusting was investigated by applying continuous artificial rain (8.5 cm/hr) to experimental plots until steady-state conditions were reached. Comparisons were made with bare plots subjected to natural rainfall for a period of 4 months. Significant differences in soil roughness between the plow only and the plow, disk, and harrow treatments resulted in higher infiltration and longer times to incipient runoff for the plow treatment. However, differences in surface roughness and infiltration and runoff rates were insignificant among treatments when steady-state conditions were reached after only 2 hours. Crust conductances, measured in situ, were significantly lower in the plow, disk, and harrow treatments for the sod as compared with the continuous corn rotation. Crusts had a significantly higher conductance when formed on top of clods as compared with crusts formed between clods in the plow treatment. Conductances of crusts formed under short-term high-energy experimental rainfall were not significantly different from those formed under natural conditions, The latter characterized by intermittent low-energy rainfall during a 4-month period. However, their morphology was significantly different. (Visocky-ISWS)
W76-03366

DO HEAVY METALS PREVENT THE AGRICULTURAL USE OF MUNICIPAL SLUDGE,
Royal Danish School of Pharmacy, Copehagen.
For primary bibliographic entry see Field 5E.
W76-03409

COMBINED DAILY CLIMATIC DATA AND DILUTE SOLUTION CHEMISTRY IN STUDIES OF SOIL PROFILE FORMATION,
C. L. Scrivner, J. C. Baker, and D. R. Brees.
Soil Sci. Vol 115, No 3, p 213-223, 1973, Illus.

Descriptors: *Soil moisture, Soil water movement, Soil horizons, Soil chemistry.

A model was developed for converting long-time daily records of temperature and precipitation into daily depths of moistening and drying of the soil. The time-depth distributions of moist and dry zones were summed and converted to a prediction equation of the form, log F = k1 -k2 log D where F is the frequency of completed moist-dry cycles, D is depth, and k1 and k2 are constants characteristics of a particular soil and climate. The average annual amount of excess precipitation that fell when soil moisture was completely recharged the numerical description of the soil moisture regime. The depth that has a frequency of 1 completed moist-dry cycle/yr coincides with the depth of solum in Missouri soils. It appears that the upper boundary of the B horizon is determined by the average depth of penetration of summer rains. Estimated amounts of water passing planes in the soil can be summed by integration of the prediction equation for depth-frequency of completed moist-dry cycles. Analyses of soil solutions produced when dry soil samples were equilibrated with water for 1 wk suggest that almino-silicate minerals react in a manner that is predicted by chemical thermodynamics. Kaolinite appears to be the stable clay mineral in a wide array of soil horizons including those with large amounts of montmorillonite. Quartz appears to be unstable in some A horizons, in layers adjacent to limestone, and in all horizons of a gibbsitic soil containing quartz.--Copyright 1973, Biological Abstracts, Inc.
W76-03450

SIMULATION OF THE RAINFALL-RUNOFF PROCESS USING A HYSTERETIC INFILTRATION-REDISTRIBUTION MODEL,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
K. K. Watson, and S. J. Lees.
Australian Journal of Soil Research, Vol 13, No 2, p 133-140, September 1975. 4 fig, 11 ref.

Descriptors: *Model studies, *Hysteresis, *Rainfall-runoff relationships, *Soil moisture, *Infiltration, Water storage, Soil water movement, Moisture content, Watersheds(Basins), Soil profiles.

The significance of the soil profile and its accompanying water status in deterministic catchment models is discussed in relation to the current use of the soil-store concept. An alternative numerical approach is described in which the movement of water into and through the soil profile (together with the determination of runoff volumes) is continuously monitored during any pattern of rainfall and non-rainfall events. A significant component in the approach is the use of a comprehensive domain-type hysteresis model for the analysis of infiltration-redistribution sequences. The simulation is illustrated by using a rainfall hyetograph of 7 hours duration (including one non-rainfall period of 1 hour) as the flux input into a homogeneous profile of a sandy loam of uniform initial water content. The time-dependent relationships of rate of surface flux, depression storage and runoff volume are calculated for the duration of the hyetograph period. Profiles of water content are also presented. (CSIRO)
W76-03451

2H. Lakes

HARVESTING AS A CONTROL FOR AQUATIC PLANTS,
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 5G.
W76-03058

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 2. PHYSICAL LIMNOLOGY OF LAKE MICHIGAN.
Report No ANL/ES-40, Volume 2, Argonne National Laboratory, Illinois, June 1975. 121 p.

Descriptors: *Lake Michigan, *Limnology, *Dispersion, *Diffusion, Lakes, Water levels, Hydrologic, aspects, Heat budget, Stratification, Circulation, Water circulation, Currents(Water), Water balance, Water properties, Water temperature, Waves(Water), Internal waves.

This report is one of a series describing the environmental status of Lake Michigan and its watershed. Broad subject areas included were: (1) physical characteristics of Lake Michigan and its responses to applied forces, and (2) diffusion and dispersion, (See W76-03106 and W76-03107) (Humphreys-ISWS)
W76-03105

PART 1. PHYSICAL CHARACTERISTICS OF LAKE MICHIGAN AND ITS RESPONSES TO APPLIED FORCES,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
C.H. Mortimer.
Environmental Status of the Lake Michigan Region, Volume 2. Physical Limnology of Lake Michigan, Report No. ANL/ES-40, Volume 2, Argonne National Laboratory, Illinois, p 1-102, June 1975. 62 fig, 1 tab, 78 ref.

Descriptors: *Lake Michigan, *Limnology, *Physical properties, Winds, Currents(Water), Temperature, Water temperature, Thermocline, Coriolis force, Upwelling, Hydrologic budget, Water levels, Circulation, Water circulation, Heat budget, Stratification, Internal waves, Waves(Water), Water properties, Lakes, Hydrology.

Representative responses of Lake Michigan to applied wind forces are: (1) wind-driven currents and near-shore geostrophic (Coriolis-balanced) currents, generally unidirectional but subject to frequent direction changes and reversals; and (2) periodic currents generated by waves, principally long internal and surface waves in the form of seiches modified by the earch's rotation, constituting the free modes of oscillation of the basin. After winter circulation, the annual temperature cycle begins with the thermal bar phase of spring warming, followed by stratification in summer and fall. After stratification, wind stress and Coriolis force combine to produce frequent and extensive upwellings. These forces generate geostrophic currents near shore and internal waves of several kinds, including those of near-inertial period (15 to 17 hr) producing rotating currents conspicuous in offshore waters. Near shore, the previously mentioned unidirectional (including Kelvin wave) responses predominate. (See also W76-03105) (Sims-ISWS)
W76-03106

PART 2. DIFFUSION AND DISPERSION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-03107

SURFACE WAVE DATA RECORDED IN LAKE ONTARIO DURING IFYGL,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 7C.
W76-03184

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
Available from the U.S. IFYGL Project Office, Great Lakes Environmental Research Laboratory, 2300 Washtenaw Avenue, Ann Arbor, MI 48104. IFYGL Bulletin No 15, August 1975, 103 p.

Descriptors: *Great Lakes, *Great Lakes region, *Lakes, Lake Ontario, United States, Canada, *Projects, Publications, *Bibliographies, Lake morphology, Water levels, Water temperature, Currents(Water).
Identifiers: Canadian project reports, Lake-averaged temperatures, Lake currents.

This bulletin contains data for both the United States and Canada. The contents of the report include: IFYGL Bibliography - which contains Official IFYGL Publications, a Bibliography, and Additions to the IFYGL Bibliography; Canadian Project Reports; Canadian IFYGL Data Management Report - which contains a list of IFYGL Data Publications, and Abstracts of IFYGL Papers; Comments by the U.S. Director; Lake-Averaged Temperatures and Currents in Lake Ontario in 1972; Lake Ontario Beginning-of-Month Levels and Changes in Storage; U.S. Scientific Program - which includes Tasks, and Panel Reports; and Data Management - IFYGL Archive.
W76-03189

SEWER SYSTEMS IN THE COMMUNITIES AROUND LAKE SEVAN (SKHEMA KANALIZATSII NASELENNYKH MEST, RASPOLOZHENNYKH VOKRUG OZERA SEVAN),
For primary bibliographic entry see Field 5D.
W76-03195

PREDICTIVE MODEL FOR PHOSPHORUS IN LAKES,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W76-03243

PRODUCTION OF MACROPHYTES OF SOME LAKES IN THE PSKOV REGION, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
For primary bibliographic entry see Field 5C.
W76-03245

A STRATEGY FOR MANAGEMENT OF MARINE AND LAKE SYSTEMS WITHIN THE NATIONAL PARK SYSTEM.
National Park Service, Washington, D.C. Office of Natural Science.
For primary bibliographic entry see Field 2L.
W76-03296

A FOOD CHAIN MODEL OF CADMIUM IN WESTERN LAKE ERIE,
Manhattan Coll., New York.
For primary bibliographic entry see Field 5B.
W76-03310

MAGNETIC SUSCEPTIBILITY OF LAKE SEDIMENTS,
Edinburgh Univ., (Scotland). Dept. of Geophysics.
For primary bibliographic entry see Field 2J.
W76-03311

STUDIES OF GULL LAKE, MICHIGAN: I. SEASONAL AND DEPTH DISTRIBUTION OF PHYTOPLANKTON,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W76-03338

RANGE AND DEFICIT ANALYSIS USING MARKOV CHAINS,
Colorado State Univ., Fort Collins.
F. L. S. Gomide.
Hydrology Papers, No 79, September 1975. 76 p, 46 fig, 3 tab, 42 ref. NSF GK-31512-X2.

Descriptors: *Reservoir storage, *Stochastic processes, *Synthetic hydrology, *Reservoir operation, Analytical techniques, *Reservoir yield, Mass curves, Model studies, Boundary processes, Water storage, Storage, Queueing theory, Markov processes, *Regulation, *River regulation.
Identifiers: Adjusted range, Accumulated deficits, Hurst phenomenon.

Two properties of the partial sums of random variables were investigated: the range and the maximum accumulated deficit. The range (or the adjusted range) was used in the design of storage capacities for full regulation of river discharges and the maximum accumulated deficit was used in the case of partial regulation. A general approach to the distribution of the range of partial sums of independent random variables was developed. The distribution of the range was shown to follow from the theory of Markov chains, when the state space is such that the boundary states are absorbing. Similarly, a general approach to the distribution of the maximum accumulated deficit of partial sums of independent random variables was developed. The distribution of the maximum accumulated deficit was shown to follow from the theory of Markov chains, when the state space is such that one boundary state is absorbing and the other is reflecting. By analogy, the distribution of the maximum accumulated deficit of partial sums of continuous, independent random variables was obtained. The similarities between range and deficit analysis and Moran's theory of reservoirs were pointed out. Practical applications were discussed and a brief note on the so-called Hurst phenomenon was included. (Singh-ISWS)
W76-03354

THE EFFECT OF BOTTOM TOPOGRAPHY ON A STRATIFIED FLOW IN THE BETA PLANE,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Fluid, Thermal, and Aerospace Sciences.
G. S. Janowitz.
Journal of Geophysical Research, Vol 80, No 30, p 4163-4168, October 20, 1975. 2 fig, 6 ref. NSF GA-31889.

Descriptors: *Velocity, *Theoretical analysis, *Boundaries(Surfaces), *Ocean currents, Oceans, Currents(Water), Pressure, Equations, Density stratification, Lakes, Drag, Steady flow.
Identifiers: *Bottom topography, Vorticity, Rossby number, Ridges.

For the case of an unsheared stably stratified eastward flow, the mean motion and baroclinic motion were decoupled, the mean motion obeying the barotropic vorticity equation. For small stratification, the baroclinic solution was obtained explicitly. The baroclinic motion had deeper water on the left near the bottom and deeper water on the right near the top in the northern hemisphere. Over a conical topography in the northern hemisphere the barotropic motion was clockwise; the baroclinic motion thus reinforced the barotropic motion near the bottom and opposed it near the top. For an unsheared current with a linear but not necessarily small stratification and an arbitary bottom topography, an explicit solution for the flow was obtained as well as an expression for the net forces exerted by the current on the topography. By using this general solution the specific example of a north-south ridge was computed in detail. This calculation confirmed the general features of the baroclinic motion which were derived for small stratification. (Adams-ISWS)
W76-03378

SOME FEATURES OF WIND ACTION ON SHALLOW LAKES,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Ingenieria.
R. B. Banks.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 101, No EE5, Proceedings Paper 11640, p 813-827, October 1975. 4 fig, 2 tab, 36 ref, 2 append.

Descriptors: Movement, *Winds, *Water circulation, *Turbulence, *Lagoons, *Lakes, Reaeration, Oxygenation, Diffusion, Mixing, Coriolis force, Wind velocity, Shallow water, Dissolved oxygen, Biochemical oxygen demand, Waves(Water), Aeration, Environmental engineering, Shear stress, *Mexico.
Identifiers: *Lake Chapala(Mexico), *Wind shear, Oxygen transport mechanisms, Velocity distribution, Turbulent diffusion coefficient, Oxygen transfer coefficient, Surface reaeration coefficient.

Wind-induced circulation in lakes and lagoons has substantial influence on the velocity distribution q, which affects the movement of suspended and dissolved substances. Coefficients of turbulent diffusion and surface reaeration are also dependent upon wind action. With the vertical turbulent diffusion coefficient K assumed constant, expressions for q were determine with and without consideration of Coriolis effects, which were subsequently neglected. K was shown to be directly proportional to the wind velocity U if the wind shear stress coefficient C sub f is constant. Investigation of the relationship between the surface reaeration coefficient K sub 2, the oxygen transfer coefficient K sub L, and K domonstrated that both K sub 2 and K sub L are directly proportional to K and thus to U, if C sub f is constant. Further investigation showed that the coefficients K, K sub 2, and K sub L are directly proportional to U to the m power where m = 1/2 for small U, m = 1 for medium U, and m = 2 for large U. (Bender-ISWS)
W76-03380

WATER WAVES GENERATED BY LANDSLIDES IN RESERVOIRS,
Engineers Waterways Experiment Station, Vicksburg, Miss. Wave Branch.
D. D. Davidson, and B. L. McCartney.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY12, Proceedings Paper 11791, p 1489-1501, December 1975. 10 fig, 2 tab, 8 ref, 1 append.

Descriptors: *Hydraulic models, *Landslides, *Waves(Water), *Montana, Model studies, Hydraulics, Lakes, Reservoirs, Protection.
Identifiers: *Wave height, *Runup, *Lake Koocanusa(Mont), Preventive measures.

A hydraulic model investigation has been conducted to ascertain the magnitude of wave height and runup to be expected from potential landslides in Lake Koocanusa at Libby Dam, Montana. Although this investigation was of a particular site, it furnished valuable information and insight into general problems of waves resulting from landslides that might be pertinent to other areas. The model study results showed the wave heights and runup to be expected at various pool elevations as well as the effect and corrective measures proposed to reduce wave heights to an acceptable level. The Libby prototype problem, model concepts, some experimental data, and conclusions pertinent to the prediction of landslide generated water waves were presented. (Lee-ISWS)
W76-03382

EVAPORATION FROM LAKE ERIE,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environment Research Labs.
For primary bibliographic entry see Field 2D.
W76-03415

U.S. IFYGL SHIPBOARD DATA ACQUISITION SYSTEM,
International Field Year for the Great Lakes Project Office, Rockville, Md.
A. Robertson.
International Field Year for the Great Lakes. Technical Manual Series No. 5, March 1974. 45 p.

Descriptors: Ships, *Great Lakes, *Data collections, *Hydrologic data, Water resources, Exploration, Data processing, Meteorological data, International Hydrological Decade, Water quality, Water resources, Oceanography, Limnology, Data processing.
Identifiers: *Shipboard data acquisition system, *Data acquisition system, *Data processing systems, Water research, Water quantity, Research vessels, Oceanographic research, Environmental parameters, Oceanographic data, Shipboard sensors.

The International Field Year for the Great Lakes (IFYGL) is a joint Canadian-United States program of coordinated environmental and water resources research focused on Lake Ontario and the Ontario watershed basin. The central objective of this program is to strengthen knowledge of this lake and its basin in order to provide a scientific basis for improved Great Lakes management activities related to water quantity, water quality, and environmentally sensitive operations. The IFYGL research activities are organized into six basic scientific programs. Several major data acquisition systems were developed specially for used during IFYGL. Reports are being prepared to document the development and operation of these systems. This present document is one in this sereies and describes the automatic on-board data acquisition systems developed for the major U.S. research vessels used during IFYGL. In this report only the automatic data acquisition systems are considered; the rather conventional procedures used aboard the ships to gather and record data by other means are not described. (NOAA)
W76-03416

CHRONIC MALNUTRITION IN FOUR SPECIES OF SUNFISH IN A THERMALLY-LOADED IMPOUNDMENT,
North Carolina Univ., at Asheville. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-03472

MANGROVE-ROOT COMMUNITIES IN A THERMALLY ALTERED AREA IN GUAYANILLA BAY, PUERTO RICO,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 5C.
W76-03487

EFFECT OF THERMAL STRESS ON PHYTOPLANKTON PRODUCTIVITY IN CONDENSER COOLING WATER,
North Carolina University. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W76-03490

2I. Water In Plants

ESTIMATION OF COOLING POWER IN A DECIDUOUS FOREST STAND,
Polish Academy of Sciences, Bialystok. Mammals Research Inst.
J. L. Olszewski.
Ekol Pol, Vol 20, No 35, p 463-477, 1972, Illus.
Identifiers: *Cooling, *Deciduous forests, *Poland, Power, Thermometers, Velocity, Winds, *Forest stands.

Measurements were made daily, from March 15, 1961-March 15, 1964 by means of a Hill catather-

mometer of cooling power in a deciduous forest stand (QuercoCarpinetum medioeuropaeum) in the Bialowieza National Park (Poland). Seasons were distinguished on the basis of the state of tree foliage and presence or absences of snow cover. Cooling power indices differ fairly distinctly. Comparison was also made of cooling power in the forest stand and in an open area outside it, where the value was found to be twice higher. The chief factor accounting for this is the very low velocity of wind in tree stands.--Copyright 1974, Biological Abstracts, Inc.
W76-03064

SPARTINA REVEGETATION ON DREDGE SPOIL IN SE MARSHES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5G.
W76-03121

ATTEMPTS AT A COMPARATIVE ECOLOGIC ANALYSIS OF FAGUS-ABIES FORESTS IN THE SWISS JURA MOUNTAINS (WEISSENTIEN AND CHASSERAL), (IN GERMAN),
For primary bibliographic entry see Field 4A.
W76-03274

DECIDUOUS WOODLANDS IN SJUHARADSBYGDEN (IN SWEDISH),
G. Wallin.
Acta Phytogeogr Suec. 58 p, 1-114. 1973, Illus. (English summary).
Identifiers: Beech, Climates, *Deciduous forests, Floristics, Grasses, Heaths, Quercus-Petraea, Quercus-Robur, Soils, Sweden(Sjuharadsbygden), *Woodlands.

The area is situated in the transition zone between the deciduous and conifer forest in Sweden. The climate is mesic (mean temperature for coldest and warmest month ca. (about) -3 and 15C, precipitation ca. 800 mm). The soil varies from poor to rich. The flora is suboceanic. Heath type oak woods (1 community, 5 variants), meadows type deciduous woods (13 communities, 7 variants) and beech woods (4 communities, 7 variants), were distinguished and 35 localities described. Floristic analyses are given but communities are not ranked. Heath type oak woods (Quercus robur and Q. petraea) occur on high, shallow ground and have a poor ground layer chiefly of dwarf shrubs and tough grasses. Meadow-type deciduous woodland usually occurs on sunny, well-watered slopes among boulders. The undergrowth is rich in sweet grasses and herbs without dwarf shrubs. The beech stands are marginal to the area of distribution of beech, but regenerate well. The ground layer is sparse to absent. The soil of the heath wood is a podzol type, transgrading to a brown earth in the meadow-type. Historical documents indicate that the forests were badly depleted during the last centuries and partly held down by grazing. During the last 100 yr the forests have regenerated.--Copyright 1974, Biological Abstracts, Inc.
W76-03300

2J. Erosion and Sedimentation

THE OFF-SITE SEDIMENT DAMAGE FUNCTION IN SELECTED ILLINOIS WATERSHEDS,
Illinois Univ. at Urban-Champaign. Dept. of Finance.
For primary bibliographic entry see Field 4D.
W76-03126

WIND EROSION: UNIFORMLY SPACING NONERODIBLE ELEMENTS ELIMINATES EFFECTS OF WIND DIRECTION VARIABILITY,
Agricultural Research Service, Manhattan, Kans.
For primary bibliographic entry see Field 4D.
W76-03127

SHORELINE CHANGES BETWEEN SABINE PASS AND BOLIVAR ROADS, AN ANALYSIS OF HISTORICAL CHANGES OF THE TEXAS GULF SHORELINE,
Texas Univ., Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 2L.
W76-03133

MAJOR AND TRACE ELEMENT ANOMALIES IN STREAM SEDIMENTS OF THE TEIGN VALLEY OREFIELD,
Southampton Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 5A.
W76-03303

MAGNETIC SUSCEPTIBILITY OF LAKE SEDIMENTS,
Edinburgh Univ., (Scotland). Dept. of Geophysics.
R. Thompson, R. W. Battarbee, P. E. O'Sullivan, and F. Oldfield.
Limnology and Oceanography, Vol 20, No 5, p 687-698, 1975. 14 fig, 12 ref.

Descriptors: *Heavy metals, *Magnetic studies, *Sediment distribution, *Iron compounds, Pollutant identification, Lake sediments.
Identifiers: *Magnetic susceptibility, Sediment cores, *Detrital magnetite, Nondestructive measurements.

Initial magnetic susceptibility in Flandrian sediments from Lough Neagh, Northern Ireland is shown to be a function of the detrital titanomagnetite of the sediment. There is some correspondence between peaks in iron concentration and high susceptibility measurements. These presumably represent levels where a major contributor to the iron content of the sediment is detrital magnetite. Parallel susceptibility changes are synchronous from core to core and thus potentially valuable for core correlation especially in view of the rapid nondestructive measuring technique. Changing susceptibility in the lake sediments studied appears to be positively correlated with variations in the amount of inwashed inorganic allochthonous material present in the cores. (Gregory-Vanderbilt)
W76-03311

DESCRIPTION OF SEASONAL BEACH CHANGES USING EMPIRICAL EIGENFUNCTIONS,
Scripps Institution of Oceanography, San Diego, Calif.
For primary bibliographic entry see Field 2L.
W76-03377

ALLOMETRIC CHANGE OF LANDFORMS,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 4A.
W76-03384

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W76-03400

FE-MN OXIDE COATINGS IN STREAM SEDIMENT GEOCHEMICAL SURVEYS,
Georgia Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-03412

2K. Chemical Processes

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES--II. CHEMICAL STABILIZATION,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-03009

ISOTOPIC COMPOSITION OF GROUNDWATER IN SEMI-ARID REGIONS OF SOUTHERN AFRICA,
National Physical Research Lab., Pretoria (South Africa).
J. C. Vogel, and H. Van Urk.
Journal of Hydrology, Vol 25, No 1/2, p 23-36, April 1975. 8 fig, 1 tab, 27 ref.

Descriptors: *Isotope studies, *Deuterium, *Groundwater, *Oxygen isotopes, *Africa, Stable isotopes, Carbon radioisotopes, Rainfall intensity, Chemistry of precipitation, Groundwater recharge, Infiltration.
Identifiers: Southern Africa.

Although the isotope content of precipitation in the semi-arid regions of southern Africa is extremely variable, groundwater samples from the same district were found to have a remarkably constant isotopic composition. The oxygen-18 content of the underground water, in general, varies by about 0.5% in given area. The differences that occur between different regions are sufficiently large to allow the groundwater of an area to be characterized by means of its oxygen-18 content. In order to localize the infiltration area of an aquifer, radiocarbon dating of the water was used. It appeared that the groundwater contains, in general, less of the heavy isotopes than takes place during periods of heavy rainfall. Examples were given where the isotope content of the groundwater is used to distinguish between different aquifers in the same region. (Gibb-ISWS)
W76-03130

A NEUTRON SCATTERING STUDY OF WATER AND IONIC SOLUTIONS - 1967, FIRST REPORT,
Union Carbide Corp., Tuxedo, N. Y. Sterling Forest Research Center.
For primary bibliographic entry see Field 1B.
W76-03260

A NEUTRON SCATTERING STUDY OF WATER AND IONIC SOLUTIONS,
Union Carbide Corp., Tuxedo, N.Y.
For primary bibliographic entry see Field 1B.
W76-03261

DETERMINATION OF TUNGSTEN IN GEOLOGIC MATERIALS BY NEUTRON ACTIVATION ANALYSIS,
Geological Survey, College Park, Md.
For primary bibliographic entry see Field 5A.
W76-03309

APPLICATION OF THE STAINTON SYRINGE METHOD TO THE ANALYSIS OF MERCURY IN NATURAL WATERS,
Fisheries and Marine Service, West Vancouver (Brittish Columbia). Pacific Environmental Inst.
For primary bibliographic entry see Field 5A.
W76-03313

GEOCHEMICAL AND BIOGEOCHEMICAL EXPLORATION RESEARCH NEAR EARLY PRECAMBRIAN PORPHYRY-TYPE MOLYBDENUM-COPPER MINERALIZATION, NORTHWESTERN ONTARIO, CANADA,
Ministry of Natural Resources, Toronto, Ontario, Canada. Ontario Division of Mines.
For primary bibliographic entry see Field 5A.

W76-03315

A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER,
California State Univ., Chico.
For primary bibliographic entry see Field 5B.
W76-03358

HEXAVALENT CHROMIUM IN THE GROUND WATER IN PARADISE VALLEY, ARIZONA,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 4B.
W76-03364

MIXING OF THERMAL AND NONTHERMAL WATERS IN THE MARGIN OF THE RIO GRANDE RIFT, JEMEZ MOUNTAINS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
F. W. Trainer.
In: New Mexico Geological Society Guidebook, 26th Field Conference, Las Cruces County, p 213-218, 1975. 3 fig, 2 tab, 12 ref.

Descriptors: *Chemical analysis, *Groundwater, *Thermal springs, *Cold springs, *Mixing, *New Mexico, Geochemistry, Hydrogeology, Groundwater movement, Water types, Water quality, Chemical properties, Chemical reactions.
Identifiers: *Jemez Mountains(N Mex).

Chemical analyses of groundwater from the marginal fault zone of the Rio Grande rift, in the southwestern Jemez Mountains, N. Mex., show that thermal water from depth mixes with local groundwater. Mixing of the waters provides evidence of groundwater flow paths in this part of the rift, and general conclusions reached in study of the mixing may be useful in investigations of thermal waters elsewhere. Water in alluvium along the Jemez River is derived principally from dilute groundwater in volcanic rocks, but many points representing samples of water from the alluvium fall outside the field typical of dilute water in the volcanic rocks. The reason for this atypical composition is clear: this water occurs down-canyon from mineral springs in the canyon floor, and the water is a mixture of local groundwater and of mineral water from the springs and probably from faults beneath the alluvium. Groundwater in carbonate rock in San Diego Canyon has a high concentration of calcium and bicarbonate, but it also contains unexpected proportions of sodium and chloride. (Woodard-USGS)
W76-03393

CHEMICAL QUALITY OF GROUND WATER IN THE NORTHERN PART OF THE ALBUQUERQUE-BELEN BASIN, BERNALILLO AND SANDOVAL COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-03394

MAP SHOWING GROUND-WATER CONDITIONS IN THE WATERMAN WASH AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1975,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 7C.
W76-03399

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W76-03400

WATER RESOURCES OF WEST-CENTRAL MISSOURI,
Geological Survey, Rollo, Mo.
For primary bibliographic entry see Field 7C.
W76-03401

WATER QUALITY, FOUNTAIN AND JIMMY CAMP VALLEYS, COLORADO, 1973,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-03404

THE CHANNELS AND WATERS OF THE UPPER SALMON RIVER AREA, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 2E.
W76-03405

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-03406

COMPLEXATION SIDE REACTIONS INVOLVING TRACE METALS IN NATURAL WATER SYSTEMS,
California Univ., Davis. Div. of Environmental Studies.
J. F. Elder.
Limnology and Oceanography, Vol 20, No 1, p 96-102, January, 1975. 3 fig, 2 tab, 13 ref.

Descriptors: *Heavy metas, *Pollutants, *Trace elements, Chemistry, *Speciation, Hydrogen ion concentration, Anions, Chemical reactions, Chemical properties, Iron, Cadmium, Copper, Zinc, Solubility.
Identifiers: *Complexation, *Side reactions, Stability constants, Competing reactions, Anionic concentration, Polynuclear complexation, Ligands.

Descriptions of trace metal speciation in natural freshwater systems are facilitated by the use of side reaction coefficients and conditional stability constants which permit simultaneous consideration of competing complexation reactions. Some specific descriptions are presented which illustrate the extreme dependence of speciation on pH and anionic concentrations. At low pH, hydroxide complexation is likely to be overshadowed by complexation by other anions. At high pH, polynuclear complexation becomes important. Graphs are included of the compuTlexation of iron (III) and cadmium(II) by hydroxide, citrate, and pyrophosphate, expressed as the log of the side reaction coefficients as a function of total ligand concentration. (Davis-Vanderbilt)
W76-03411

FE-MN OXIDE COATINGS IN STREAM SEDIMENT GEOCHEMICAL SURVEYS,
Georgia Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-03412

COMBINED DAILY CLIMATIC DATA AND DILUTE SOLUTION CHEMISTRY IN STUDIES OF SOIL PROFILE FORMATION,
For primary bibliographic entry see Field 2G.
W76-03450

2L. Estuaries

IMPACT OF KRAFT PULP-MILL EFFLUENTS ON ESTUARINE AND COASTAL FISHES IN APALACHEE BAY, FLORIDA, USA,
Florida State Univ., Tallahassee. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W76-03018

DIVERSITY AND OVERLAP AS MEASURES OF ENVIRONMENTAL QUALITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 6G.
W76-03024

SALINITY TOLERANCE OF THE TIDEPOOL SHRIMP PALAEMON RITTERI HOLMES,
Pennsylvania State Univ., Wilkes-Barre.
For primary bibliographic entry see Field 5C.
W76-03040

EFFECT OF SOUTH LOUISIANA CRUDE OIL AND NO. 2 FUEL OIL ON GROWTH OF HETEROTROPHIC MICROORGANISMS, INCLUDING PROTEOLYTIC, LIPOLYTIC, CHITINOLYTIC AND CELLULOLYTIC BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-03054

A STUDY OF THE INTERTIDAL MACROFAUNA AROUND THE BP REFINERY (KENT) LIMITED,
City of London Polytechnic (England). Dept. of Biological Sciences; and Sir John Cass Coll., London (England). School of Science and Technology.
For primary bibliographic entry see Field 5B.
W76-03055

ECONOMIC EFFECTS OF LAND SUBSIDENCE DUE TO EXCESSIVE GROUNDWATER WITHDRAWAL IN THE TEXAS GULF COAST AREA,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4B.
W76-03099

SEASONAL CHARACTERISTICS OF WATER MASSES IN MUIR INLET, A FJORD WITH TIDEWATER GLACIERS,
Alaska Univ., College. Inst. of Marine Science.
J. B. Matthews, and A. V. Quinlan.
Journal of the Fisheries Research Board of Canada, Vol 32, No 10, p 1693-1703, October 1975. 6 fig, 24 ref.

Descriptors: *Fjords, *Salinity, *Dissolved oxygen, *Glaciers, *Alaska, *Arctic, Density, Seasonal, Temperature, Water temperature, Runoff, Snowmelt, Melt water, Ablation, Melting, Coasts, Oceanography, Inlets(Waterways), Bays, Tides, Water circulation, Cold regions.
Identifiers: *Muir Inlet (Alaska).

The presence of two distinct seasonal water masses with transitions between them has been revealed in Muir Inlet, a fjord with tidewater glaciers in southeast Alaska. In spring a homogeneous water mass was found in which over 70% of the water fell into the ranges 31.0-31.2 parts per thousand salinity and 3.0-3.5 C. Heterogeneous water masses were found in summer and fall. The transition from the homogeneous to the heterogeneous water mass was explained on the basis of an entrainment mechanism during the summer high runoff period. It was suggested that the momogeneous spring condition derives from the intrusion of water from outside the fjord over the entrance sill which continues into early summer. This water exchange is driven primarily by tidal energy and depends upon denser water being available outside the sill during fall and spring. The differences between inlets with and without tidewater glaciers result from the melting of glacial ice in contact with warm, saline water

asses. The melting of glacial ice appeared to con-
ue at all seasons in Muir Inlet. The dissolved ox-
en content confirmed the almost continuous
newal, showing only relatively small seasonal
riations. (Sims-ISWS)
76-03112

FECTS OF STRUCTURES ON IRREGULAR AVES COMPARED TO REGULAR WAVES,
val Univ., Quebec. Dept. of Civil Engineering.
r primary bibliographic entry see Field 8B.
76-03119

AVES OF MAXIMUM HEIGHT ON UNIFORM RRENTS,
laware Univ., Newark. Coll. of Marine Studies;
d Deleware Univ., Newark. Dept. of Civil En-
eering.
r primary bibliographic entry see Field 8B.
76-03120

ARTINA REVEGETATION ON DREDGE OIL IN SE MARSHES,
daway Inst. of Oceanography, Savannah, Ga.
r primary bibliographic entry see Field 5G.
76-03121

ORELINE CHANGES BETWEEN SABINE SS AND BOLIVAR ROADS, AN ANALYSIS HISTORICAL CHANGES OF THE TEXAS LF SHORELINE,
xas Univ., Austin. Bureau of Economic Geolo-

A. Morton.
ological Circular 75-6, 1975. 43 p, 11 fig, 1 tab,
ref, 3 append.

scriptors: *Shores, *Gulf coastal plain,
osion, *Geomorphology, *History, *Texas,
level, Sediment distribution, Storms, Hur-
nes, Vegetation effects.
ntifiers: *Sabine Pass(Tex), *Natural
cesses.

torical monitoring between Sabine Pass and
ivar Roads recorded the nature and magnitude
hanges in position of the shoreline and vegeta-
line and provided insight into the factors af-
ing those changes. Long-term trend or
ction of shoreline changes averaged over the
ear time period of this study indicated that net
retion was 2225 feet at Sabine Pass. Net ero-
dominated the shoreline from the preceding
ment to approximately 3 miles east of Crystal
ch. Net erosion for this segment over the 92-
time interval averaged 775 feet or 8.4 feet per
. Major and minor factors affecting shoreline
nges included: (1) climate, (2) storm frequency
intensity, (3) local and eustatic sea-level con-
ns, (4) sediment budget, and (5) human activi-
Studies indicated that changes in shoreline
vegetation line between Sabine Pass and
var Roads were largely the result of natural
esses, perhaps expedited by man's activities.
wmik-ISWS)
-03133

ROXIMATE BIOLOGICAL SURVEY OF D DIEGO BAY, CALIFORNIA,
al Undersea Center, San Diego, Calif.
primary bibliographic entry see Field 5C.
-03170

CULATIONS AND DENSITY DISTRIBU-NS IN A DEEP, STRONGLY STRATIFIED, D-LAYER ESTUARY,
s Hopkins Univ., Baltimore, Md. Dept. of
hanics and Materials Sciences; and Johns
kins Univ., Baltimore, Md. Dept. of Earth and
ary Sciences.
Long.

Available from NTIS, Springfield, Va 22161 as AD-A006 737, $3.50 in paper copy, $2.25 in microfiche. Office of Naval Research Technical Report No. 7, (Series C), February, 1975. 24 p, 5 fig, 16 ref.

Descriptors: *Bodies of water, *Estuaries, *Model studies, *Distribution, *Mixing, *Stratification, Subcritical flow, Supercritical flow, Turbulence, Encroachment.

A theoretical model of statistically steady flow in a strongly stratified estuary is presented. A holocline is assumed to be present and the lower layer is taken to be deep and non-turbulent. The outflowing upper fluid mixes with the salty lower fluid and the flux of the brackish water increases with distance from the head of the estuary. The mixing is assumed to be similar to that in laboratory models of mixing across density interfaces. Two equations of mass conservation are used, one for the steady-state mass flux across a vertical section from top to bottom of the channel and one for the mass flux into a section of the upper fluid. A buoyancy conservation equation is used for the buoyancy flux across a vertical section. A final equation is obtained by integrating the horizontal equation of motion across a section of the upper fluid. The flow in this layer is assumed to be opposed by a frictional force proportional to the square of the velocity averaged over the layer. The pressure-gradient force arising from the slope of the free surface is solved for in terms of the thickness of the upper layer, the buoyancy difference across the interface, the slope of the interface and the horizontal density gradient in the upper layer. The derivation shows that the horizontal pressure-gradient force vanishes in the lower layer. The mathematical problem reduces to two ordinary differential equations for the flux in the upper layer and the thickness of the layer. The complete solution is obtained as a function of the fresh-water influx per unit width, the rms turbulent velocity, the estuary length and the buoyancy of sea water. (Sinha-OEIS)
W76-03172

LONG-TERM VARIABILITY IN THE STRUCTURE OF SUBTIDAL BENTHIC COMMUNITIES IN PUGET SOUND, WASHINGTON, USA,
Nordic Council for Marine Biology, Biomsterdalen (Norway). Espegrend Biological Station.
For primary bibliographic entry see Field 5C.
W76-03173

EFFECTS OF OCEAN DISPOSAL ACTIVITIES ON MID-CONTINENTAL SHELF ENVIRONMENT OFF DELAWARE AND MARYLAND,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 5C.
W76-03175

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF NEARSHORE ZONE OF SAND KEY, FLORIDA, PRIOR TO BEACH RESTORATION. VOLUME I,
National Marine Fisheries Service, Panama City, Fla. Gulf Coastal Fisheries Center.
C. H. Saloman.
Available from NTIS, Springfield, Va 22161 as AD-A007 422, $16.25 in paper copy, $2.25 in microfiche. Department of the Army, Fort Belvoir, VA, Coastal Engineering Research Center (CERRE-EC) Report, Vol 1, June 1974. 699 p, 145 fig, 114 tab, 18 ref, appends.

Descriptors: *Beach erosion, *Surveys, Sampling, Environment, Environmental effects, Aquatic environment, Coasts, Coastal engineering, Dredging, *Florida, Data collections, Bibliographies.
Identifiers: *Nearshore zone, *Sand Key(FL), Beach restoration.

Continuing erosion along the gulf side of Sand Key, Florida, has reduced desirable beach areas and rendered shore installations vulnerable to storm damage. The U.S. Army Corps of Engineers plans to restore the damaged beaches and, as necessary, to periodically nourish them to control further erosion. In order to assess the ecological effects of the proposed hydraulic dredging, some of the major physical, chemical, and biological characteristics of the nearshore zone off Sand Key prior to restoration are defined. Also included are results of a supplemental study on the effects of hydraulic dredging for emergency restoration of Sunset Beach on Treasure Island, Florida and a bibliography of published and unpublished information pertinent to the physical, chemical, and biological characteristics of the nearshore zone. (Sinha-OEIS)
W76-03177

HYDROLOGY AND CIRCULATION PATTERNS IN THE VICINITY OF OREGON INLET AND ROANOKE ISLAND, NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Geosciences.
For primary bibliographic entry see Field 2E.
W76-03178

DAILY AND WEEKLY UPWELLING INDICES, WEST COAST OF NORTH AMERICA, 1967-73.
National Marine Fisheries Service, Monterey, Calif. Pacific Environmental Group.
Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. NOAA Technical Report NMFS SSRF-693, August 1975. 114 p, 3 fig, 6 tab, 8 ref, append.

Descriptors: Upwelling, *Circulation, Oceans, Coasts, *Currents(Water), *Ocean currents, Water circulation, North America, Stress, Atmospheric pressure, Spatial distribution.
Identifiers: *Upwelling indices, *Coastal upwelling, *Ekman transport, Ekman layer, *Sea surface stress, Offshore transport, Fishery resources, Stress calculation, Upwelling plots, Upwelling tabulations.

Daily and weekly indices of intensity of large-scale wind-induced coastal upwelling at selected locations along the west coast of North America are presented for the 7-yr period, 1967-73. The indices are based on 6-hourly computations of the offshore component of Ekman transport using the synoptic surface atmospheric pressure analyses produced by the Fleet Numerical Weather Central to estimate the sea surface stress. The magnitude of offshore transport is considered an indication of resultant upwelling through the bottom of the Ekman layer. A spatial distortion in absolute magnitude results in noncomparability of numerical values between different locations. (NOAA)
W76-03179

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF NORTH CAROLINA, NORTH OF CAPE LOOKOUT,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2B.
W76-03181

WATER MOVEMENT WITHIN THE APEX OF THE NEW YORK BIGHT DURING SUMMER AND FALL OF 1973,
National Oceanic and Atmospheric Administration, Miami, Fla. Physical Oceanography Lab.
R. L. Charnell, and D. A. Mayer.
NOAA Technical Memorandum ERL MESA-3, April 1975. 29 p, 18 fig, 2 tab, 5 ref.

Descriptors: *Currents(Water), *Water circulation, *Ocean circulation, *Current meters, Tides, Winds, Flow, Water quality, Flow measurement, New York.

Identifiers: *New York Bight, *Current meter data, Environmental conditions, Physical oceanography.

An investigation of the water movement within the New York Bight Apex was made during the summer and fall of 1973. Observations from this study produced a fairly consistent picture of general clockwise circulation for the mean and low frequency (periods greater than 40 hr) current motions. Additionally, the effects of stratification on the vertical structure of the flow showed the difference between the summer and late fall flow regimes. There also appeared to be, for low frequencies, excellent spatial coherence between stations in the apex area and a fairly strong relation between meteorological forcing and current motions; currents tended to lag wind by up to 18 hr. (NOAA)
W76-03185

ANNUAL SUMMARY OF RESEARCH RESULTS FOR FISCAL YEAR 1974, MESA NEW YORK BIGHT PROJECT.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
NOAA Technical Memorandum ERL MESA-2, September 1975. 193 p, 106 fig, 2 tab, 120 ref.

Descriptors: *Project planning, *Projects, Geological surveys, Oceanography, Marine geology, Sewage sludge, Water pollution, Water quality, *Sewage disposal, Coasts, Coastal structures, New York, Waste disposal.
Identifiers: *New York Bight, *Ocean dumping, Offshore facilities.

This is the first annual summary of research results of the National Oceanic an Atmospheric Administration's (NOAA) Marine EcoSystems Analysis (MESA) Program New York Bight Project. It summarizes the scientific technical and engineering accomplishments of the Project during fiscal year 1974 (FY74), the last quarter of FY73, not summarized previously. Results pertinent to the pressing issue of ocean disposal of sewage sludge in the New York Bight, accomplished from the last quarter of FY73, through the first quarter of FY75 are summarized in a separate report entitled 'Ocean Dumping in the New York Bight.'. Research results are presented in a classical discipline orientation; physical, chemical, biological and geological research efforts are discussed in some detail, including significant data and results. (NOAA)
W76-03186

NEW YORK BIGHT PROJECT, WATER COLUMN SAMPLING CRUISES NO 1-5 OF THE NOAA SHIP FERREL, AUGUST-NOVEMBER 1973,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 7C.
W76-03187

AN AVERAGE, LONG-PERIOD, SEA-LEVEL SERIES FOR THE UNITED STATES,
National Ocean Survey, Rockville, Md.
S. D. Hicks, and J. E. Crosby.
Available from the National Technical Information Service, Springfield, Va 22161. NOAA Technical Memorandum NOS 15, September 1975. 6 p, 1 fig, 10 ref.

Descriptors: *Sea level, *Water levels, *Tides, Elevation, Tidal effects, Tidal waters, Water measurement, Water level recorders, Meteorological data, Oceanography, United States.
Identifiers: *Sea level series, *Sea level management, *Water elevation, *Tide gage measurements, Meteorological oscillations, Oceanographic oscillations, Water level management, Tide measurements, Tide stations.

An average, long-period, sea-level series for the United States (except Alaska and Hawaii), from which a representative curve and a single-value rate were derived, is presented for the first time. The series was obtained by averaging common-length, uninterrupted, sea-level series obtained from tide gage measurements. The averaging was by coastal area. The curve, with amplitudes of its meteorological and oceanographic oscillations of periods less than 5 1/3 years attenuated more than 90%, shows the relative, apparent secular trend and its changes for the United States as a whole. During the 34-year period, 1940 through 1973, sea level rose along the coasts of the United States at the average rate of 1.5mm (0.005 ft) per year. (NOAA)
W76-03188

ESTUARY TO BE STUDIED AS D.C. WATER SOURCE,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.
For primary bibliographic entry see Field 5F.
W76-03208

A STRATEGY FOR MANAGEMENT OF MARINE AND LAKE SYSTEMS WITHIN THE NATIONAL PARK SYSTEM.
National Park Service, Washington, D.C. Office of Natural Science.
Dune Stabilization Study, Natural Science Report No. 6, 1973, 40 p.

Descriptors: *Shore protection, *Beaches, *Dunes, National lakeshores, National seashores, Stabilization, Erosion, Barriers, Balance of nature, Deposition(Sediments), Sand bars, Vegetation establishment, Tidal marshes, Reefs, Management, *Comprehensive planning.
Identifiers: Barrier islands.

The approach followed by the National Park Service for conservation of lakeshores and seashores under their jurisdiction is based on understanding the nature of the shoreline material and its behavior under natural and anthropogenic stress. Management strategies are based on the concept that stable features are in conflict with nature; in areas stressing natural landscapes, management strategy must be tolerant of both short and long term change. Locations of natural historic significance may require stabilization of short-term changes, however, long-term trends will require continuing corrective measures at considerable cost. A sound management strategy includes acquisition and control of lands and waters adjacent to the coastal intefaces; where acquisition is not feasible efforts should be directed toward encouragement of wise land and water use policies. Management decisions affecting primary interfaces are at best short-term or temporary while those affecting more mature ecosystems have a long life expectancy. Restoration projects should rely on native materials and the forms enhanced should be consistent with naturally occurring forms. Master plans for the new marine park areas and revised plans for older areas should include analyses of physical interfaces and ecotones, and decisions should be based on these boundaries and the surfaces between. (Auen-Wisconsin).
W76-03296

VARIATIONS IN THE HYDROCHEMICAL REGIME OF THE COASTAL WATERS IN WINTER INFLUENCED BY MACROPHYTES, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
For primary bibliographic entry see Field 5C.
W76-03305

APPLICATION OF THE STAINTON SYRINGE METHOD TO THE ANALYSIS OF MERCURY IN NATURAL WATERS,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environmental Inst.
For primary bibliographic entry see Field 5A.
W76-03313

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W76-03356

A NUMERICAL MODEL OF THE CIRCULATION IN CIENFUEGOS BAY, CUBA,
Kiel Univ. (West Germany). Institut Fuer Meereskunde.
M. Tomczak, Jr., and C. Garcia Diaz.
Estuarine and Coastal Marine Science, Vol 3, No 4, p 391-412, October 1975. 14 fig, 18 ref.

Descriptors: *Circulation, *Estuaries, *Hydrodynamics, *Rivers, *Model studies, Fisheries, Numerical analysis, *Path of pollutants, Water temperature, Salinity, Diffusion, Bays, Water circulation, Wet seasons, Dry seasons.
Identifiers: *Cienfuegos Bay(Cuba) *Carribean Sea, Hydrodynamic numerical methods, Two-layered estuary.

The circulation in Cienfuegos Bay, a very shallow (less than 30 m depth) nearly enclosed bay of estuarine characteristics, was calculated, integrating the hydrodynamic equations numerically and including frictional and diffusive terms. In order to reproduce the observed shallow pycnocline and the surface density distribution, the coefficient of virtual diffusion has to be inversely proportional to the square of the density gradient. Transitory internal periodic motion was damped out by applying relatively strong bottom friction. The resulting density distribution compared well with observations. The circulation was modeled both for wet and dry season. River runoff governs the circulation during the wet season. In the northern part of the bay the surface layer of outgoing fresh water is very shallow (2 m or less) but deepens as the outlet into the Carribean Sea is approached. The southern part of the bay shows only a very little motion. The area around the industrial town of Cienfuegos is nearly stagnant throughout the year especially during the wet season. (Singh-ISWS)
W76-03374

A NOTE ON AQUADRATIC FRICTION IN THE PRESENCE OF TIDES,
John Hopkins Univ., Baltimore, Md. Cheaspeake Bay Inst.
J. R. Hunter.
Estuarine and Coastal Marine Science, Vol 3, No 4, p 473-475, October 1975. 2 ref.

Descriptors: *Tides, *Friction, *Boundary layer, *Ocean currents, *Velocity, Mathematical studies, Estuaries, Hydraulics, Tidal streams, Ocean circulation.
Identifiers: *Quadratic friction, Scalar friction, Two-dimensional models.

It has long been realized that time averaging a quadratic friction term, in the presence of strong tidal currents, gives a frictional force that is linearly dependent on the mean current. An analysis showed that the friction coefficient is twice as large in a direction parallel to the tidal current as in a direction perpendicular to the tidal current. This implied an increased tendency for mean current to flow at right angles to the tidal stream. Many two-dimensional models utilize a scalar friction coefficient to account for bottom friction. The best estimate for that coefficient is probably the average of the parallel and perpendicular values. (Singh-ISWS)

776-03375

THEORETICAL MODEL OF THE FLOW IN HE MOUTH OF SPENCER GULF, SOUTH USTRALIA,
inders Inst. of Atmospheric and Marine iences, (Australia).
A. T. Bye, and J. A. Witehead, Jr.
stuarine and Coastal Marine Science, Vol 3, No p 477-481, October 1975. 3 fig, 3 ref. NSF GA-447.

escriptors: *Gulfs, *Estuaries, *Flow, irculation, *Australia, *Salinity, Saline water stems, Density currents, Oceanography, Model udies, Theoretical analysis, Currents(Water), stribution patterns.
entifiers: *Circulation pattern, *Spencer lf(South Australia), Theoreticl model, Surface rrents, Bottom currents.

e salinity distribution in Spencer Gulf, South stralia, indicates an inflow of low salinity water the west side of the gulf, modification of the ter mass at the northern end, and an outflow of ter of increased salinity on the east side. This stem appears to be an excellent example of a oretical model recently proposed for flushing ntrolled by a buoyancy-inertial current. (Lee-WS)
76-03376

SCRIPTION OF SEASONAL BEACH ANGES USING EMPIRICAL EIGENFUNC-ONS,
ipps Institution of Oceanography, San Diego, if.
D. Winant, D. L. Inman, and C. E. Nordstrom.
rnal of Geophysical Research, Vol 80, No 15, p 9-1986, May 20, 1975. 11 fig, 1 tab, 13 ref.

criptors: *Beaches, *Beach erosion, *Profiles, rracing, *California, Waves(Water), Littoral t, Berms, Statistical methods, Tides, morphology, Seasonal.
ntifiers: *Eigenfunctions, *Torrey Pines ch(Calif), Bars.

2-yr set of profile data from Torrey Pines ch, California, measured at monthly intervals been statistically analyzed by using empirical nfunctions. The analysis separated the tem-al and spatial dependence of the data, this aration permitting beach changes to be cribed objectively by a linear combination of esponding time and space functions. Most of variation in profile configuration can be ac-nted for by three eigenfunctions corresponding ie three largest eigenvalues. The largest eigen-e corresponds to an eigenfunction called the an beach function,' which represents an age profile. A second eigenfunction, the 'bar-n function,' has a large maximum at the loca-of the summer berm and a minimum at the lo-n of the winter bar, indicating its relation to easonal onshore-offshore movement of sand. third eigenfunction, the 'terrace function,' has aximum at a location of the low-tide terrace. lts of the study indicated that the eigenfunc-are useful in the analysis of beach profile and provide objective insight into the nature ne variations of the profile configuration. wmik-ISWS)
-03377

EFFECT OF BOTTOM TOPOGRAPHY ON RATIFIED FLOW IN THE BETA PLANE,
Western Reserve Univ., Cleveland, Ohio. of Fluid, Thermal, and Aerospace Sciences.
rimary bibliographic entry see Field 2H.
03378

SECOND-ORDER WAVE FORCE ON LARGE VERTICAL CYLINDER,
Chicago Bridge and Iron Company, Plainfield, Ill. Marine Research and Development.
For primary bibliographic entry see Field 8B.
W76-03381

SUMMARY, FINAL REPORT 1975, OREGON COASTAL CONSERVATION AND DEVELOPMENT COMMISSION.
(1975), 50 p.

Descriptors: *Coasts, *Oregon, *Interstate commissions, Publications, Management, Environmental effects, Economic impacts, Resource development.
Identifiers: Oregon Coastal Commission, Coastal zones, *Commission report, Management program, Policy developments, Environmental impacts, Economic impacts, Resource management, *Coastal Zone Management.

This report is a synopsis of the Oregon Coastal Conservation and Development Commission's final report for 1975. It includes a brief description of the Policy Development Process used by the Commission; a listing of the goal, objectives, policies, necessary and recommended actions of the management program; and a brief description of the management program support processes. (NOAA)
W76-03418

AESTHETIC RESOURCES OF THE COASTAL ZONE.
Mann (Roy) Associates, Inc., Cambridge, Mass.
Office of Coastal Zone Management, July 1975, 208 p.

Descriptors: *Coasts, *Aesthetics, Recreation, Scenery, Community development, Shores, Land use, Land resources, Water resources, Resources development.
Identifiers: Aesthetic resources, Coastal zone, *Coastal zone management, *Coastal resources, Water use, Shorelines, Resource planning, Resource management.

The purpose of this handbook is to guide state coastal zone management agencies in the preparation of planning elements for the delineation and management of coastal aesthetic resources. The handbook presents background information, definitions, criteria, procedures for aesthetic resource identification and documentation. Procedures for inventorying and mapping are discussed, as are methods and criteria for defining boundaries of geographic areas of particular aesthetic concern and outstanding aesthetic resource areas. Relative merits of major generic methodologies of coastal landscape assessment are identified. Criteria are developed for determining those aesthetic resources which are sensitive to development, and for identifying features of land and water uses and structures which are typically incompatible with specified aesthetic resources. Finally, means for implementation of state aesthetic resource planning recommendations are identified, including management tools at state, regional, and local jurisdiction levels, and methods by which the public can participate in the aesthetic resource planning process. (NOAA)
W76-03419

THE EFFECTS OF FRESHWATER INFLOWS ON HYDROLOGICAL AND BIOLOGICAL PARAMETERS IN THE SAN ANTONIO BAY SYSTEM, TEXAS,
Texas Parks and Wildlife Dept., Austin, Coastal Fisheries Branch.
R. Childress, E. Bradley, E. Hagen, and S. Williamson.
NOAA Project No 2 - 160-R, August 1975, 210 p.

Descriptors: Freshwater, *Water quality, *River flow, *Inflow, Rivers, Fresh water fish, Sampling, Hydrologic data, Biological properties, Water sources, Rivers, Channel flow, Currents(Water), Meteorological data, Aerial photography, *Texas.
Identifiers: *Freshwater inflows, *River inflows, Hydrological parameters, Biological parameters, *San Antonio Bay system(Tex), Meteorological parameters, Fish landings, Shellfish landings, Estuarine biota.

Between September 1971 and May 1974, semi-monthly samples of biologic, water quality, and meteorologic parameters were taken at various stations in the San Antonio Bay system of Texas. Hydrographic parameters concerning current movements were measured at selected intervals. The biological data and historical commercial fish and shellfish landings statistics were subjected to computerized analysis for possible correlations with simple and cumulative lag river inflow to the estuary and various hydrologic parameters. These analyses were performed in an effort to determine the importance of freshwater inflows, their effect on estuarine biota, and the quantity and quality of fresh water required by the system. Maps based on aerial photography were used to measure the dimensions of physical features within the system. Riverflow was the major source of fresh water and thereby exerted the most influence on the hydrologic parameters of the system. Rainfall supplied much less water than riverflow and was always exceeded by evaporation when averaged annually. Riverflow was also the main source of nutrients to the bay supplying an estimated daily average of 32 metric tons of phosphorus and 26 metric tons of nitrogen. (NOAA)
W76-03420

WAVE TRANSFORMATIONS OVER A SLOPING BOTTOM AND OVER A THREE-DIMENSIONAL SHOAL,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
J. R. Walker.
PhD Dissertation, May 1974, 156 p. Miscellaneous Rept No 11, U Hawaii-Look Lab-75-11, UNIHI-Sea Grant-CR-75-03.

Descriptors: *Waves(Water), *Shoals, *Refraction(Water waves), Ocean waves, Shallow water, Currents(Water), Fluctuations, Water circulation, Wavelengths, Water levels.
Identifiers: *Wave transformations, *Three-dimensional shoals, *Wave height, *Wave breaking, *Wave refraction, Wave-height growth, Wave-height decay, Phase velocities, Refraction patterns, Refraction analysis, Water waves.

This dissertation is concerned with the transformation of waves over a sloping bottom and over a three-dimensional shoal. The primary objective of this study was to ascertain the effect of wave height and wave breaking on wave refraction over a three-dimensional shoal. A hydraulic model was constructed to study the phenomena. The model study was conducted in two phases. First, wave transformations over a constant bottom slope propagating from intermediate water depths through the breaking zone in shallow water depths were studied. In this series of tests, the wave-height growth, decay, and phase velocities were studied. The second series of tests was conducted to ascertain the refraction patterns over a three-dimensional shoal. Measured refraction patterns and coefficients were compared with refraction patterns predicted by conventational refraction analysis techniques which use Airy wave theory. The refraction patterns over the three-dimensional shoal were observed to be a function of wave height and wave breaking. The waves with small heights followed the refraction patterns predicted by conventional refraction techniques well. Results showed that conventional refraction analysis is a function of finite height and wave breaking. (NOAA)
W76-03421

HEAT INFLUENCES IN ESTUARINE ECOSYSTEMS,
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-03489

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

CONTINUED STUDIES ON THE USE OF A MIXED CHROMATE-PHOSPHATE INHIBITOR IN DESALINATION SERVICE: PART TWO,
Dow Chemical Co., Midland, Mich.
B. D. Oakes, S. R. Wilson, and C. F. Schrieber.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 976, $5.00 in paper copy, $2.25 in microfiche. OWRT/S--1976/8, June 1975, 84 p, 23 fig, 15 tab. OSW-14-30-3111.

Descriptors: *Desalination, *Distillation, *Sea water, *Corrosion, *Water chemistry, *Inhibitors, Copper alloys, Steel alloys.
Identifiers: Materials of construction.

A chromate-phosphate corrosion inhibitor has been developed and tested for protection of metal surfaces in desalination plants. Continuous addition of 2.5 to 5.0 ppm of the inhibitor (9 parts phosphate to 1 part chromate) effectively controls corrosion of structural, stainless, and low alloy steels and copper alloys. The protection is achieved at dissolved oxygen levels of near zero to 500 parts per billion. Two to ten-fold reduction of corrosion rate on steels, depending somewhat on temperature, pH, velocity and dissolved oxygen is attainable. A greater reduction is possible with copper alloys. This inhibitor is not suitable for aluminum alloys. Use of this inhibitor is recommended for new plants of all steel construction as well as for use in existing plants that are experiencing excessive steel and copper alloy corrosion. Techniques are available to allow recycling of chromate with no ecological damage to environment. Cost of inhibitor addition is 3.8 cents per thousand gallons of potable water. (OWRT)
W76-03143

DEVELOPMENT, FABRICATION AND TESTING OF A PPB COPPER ANALYZER,
Dow Chemical Co., Midland, Mich.
B. P. Webb.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 688, $4.00 in paper copy, $2.25 in microfiche. OWRT/S--1976/5, March 1973, 35 p, 13 fig, 1 tab. OSW 14-30-3035.

Descriptors: *Desalination, *Distillation, *Sea water, *Corrosion, *Copper alloys, *Water chemistry, Water analysis, Color reactions, Spectrophotometry.
Identifiers: Ion complexing, Particulate copper.

A parts per billion (ppb) total copper analyzer has been developed, fabricated and tested. Samples from desalination plant waste streams contain copper in three distinct forms, ionic, complexed, and particulate, all of which must be converted to a common form for colormetric analysis of 'total' copper. Acid conversion is the most common method with hydrofluoric being preferred over hydrochloric or nitric. The addition of colorimetric reagent results in a colored complex, the amount of color being a function of copper concentration. The amount of color as determined spectrophotometrically is related to the 'total' copper concentration in the sample stream. Field testing of the completed analyzer under actual and experimental desalting plant conditions has shown it to be a highly reliable and accurate instrument when compared to actual laboratory copper analyses by conventional methods. (OWRT)
W76-03144

SEA WATER CORROSION TEST PROGRAM: PART THREE,
Dow Chemical Co., Midland, Mich.
C. F. Schrieber, T. D. Boyce, A. L. Whitted, S. E. Hill, and B. P. Webb.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 671, $7.50 in paper copy, $2.25 in microfiche. OWRT/S--1976/10, January 1973, 179 p, 83 fig, 6 tab, 16 ref. OWS 14-01-0001-2150.

Descriptors: *Desalination, *Distillation, *Sea water, *Corrosion, *Aluminum alloys, *Copper alloys, Steel, Metals, Deaeration, Oxidation.
Identifiers: *Dissolved oxygen concentration.

This report discusses the roles of oxygen and temperature as they influence corrosion behavior of an alloy system. At low or intermediate dissolved oxygen (DO) concentrations (75 ppb) sea water temperature through 250 F had little effect on the behavior of the copper alloy family. However, at 500 ppb DO a temperature increase of 70 F (from 180 to 250 F) more than doubled the corrosion rates of copper alloys and mild steel. The aluminum alloys as a family were not strongly influenced by temperature increases in this range. It was noted that initial exposure of aluminum to low levels of DO concentration tended to reduce corrosion by forming a protective oxide film that serves as an effective barrier to further corrosive attack. 70-30 CuNi was found to be especially resistant to high DO concentrations followed by 90-10 CuNi and by aluminum brass. 1010 mild steel registered poorly on a comparative basis. (See also W70-01397, W70-02691, and W71-07975). (OWRT)
W76-03145

SEA WATER CORROSION TEST PROGRAM: PART FOUR,
Dow Chemical Co., Midland, Mich.
C. F. Schrieber.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 672, $8.00 in paper copy, $2.25 in microfiche. OWRT/S--1976/11, April 1975. 239 p, 105 fig, 30 tab, 7 ref. OSW 14-30-3111.

Descriptors: *Desalination, *Distillation, *Sea water, *Corrosion, *Pitting, Copper alloys, Aluminum alloys, *Electrochemistry, Steel, Deaeration, Oxidation, Metals.
Identifiers: *Crevice corrosion.

This report makes important contributions to existing electrochemical techniques to predict alloy pitting in saline waters. A galvanic series for alloys in hot sea water routinely used in desalination is developed. Among other subjects discussed are: Corrosion behavior of selected alloys in high temperature (290-320 F) softened sea water; effect of dissolved gases on alloy corrosion in the vapor and condensed vapor zones; corrosion behavior of alloys in quiescent sea water. The impingement resistance of AISI 1020 mild steel and type 316 stainless steel and the current density requirements for cathodic protection of steel in hot water are also considered. Appendices include procedures for analyses of dissolved oxygen and carbon dioxide in sea water as well as the determination of total alkalinity in sea water and decarbonated sea water. A special appendix treating of heat transfer and fouling resistance theory is included. (OWRT)
W76-03146

STUDY OF CROSSLINKED POLYMERS FOR DESALINATION,
Chemico Process Plants Co., El Monte, Calif. Envirogenics Systems.
R. W. Lawrence, and W. J. Schell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 934, $4.00 in paper copy, $2.25 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-996, July 1974. 38 p, 9 tab, 7 fig, 14 ref. OWRT Contract 14-30-3190.

Descriptors: Desalination, *Demineralization, *Separation techniques, Water treatment, Adsorption, *Desalination processes, Solvation, Water purification, Feasibility studies, Waste water treatment, Diffusion.
Identifiers: Polymer solvation, *Crosslinked polymers, Diffusion coefficients, Water Sorption rates, Salt rejection, Water diffusivity, Polyether urethanes.

An investigation was conducted on the feasibility of desalination by sorption of water from a brine into a resin and recovery of desalinated water by desorption from the resin at an elevated temperature. The envisioned process consists of sorption into a column of resin beads, rinsing of the column to remove the brine, desorption at a higher temperature to produce desalinated water and repetition of the process. Crosslinked polyether urethanes were investigated and found to provide salt rejections up to 98% depending on the temperatures of sorption and desorption. The polyurethane offering the best desalination capability was prepared from an oxyethylene-oxypropylene copolyether diol, tolylene diisocyanate and trimethylolpropane. This resin had a water diffusion coeffient of 2 x 10-7 cm2/sec, comparable to that of cellulose acetate. With this coefficient and an estimate of the thermal diffusivity, and assuming a resin bead diameter of 0.6 mm, a cycle time of 43 min was calculated for the process between the temperatures of 21 and 31 C. Under these conditions, the daily productivity would be 118 gal per 100 lbs of resin. Calculations of the energy requirements showed that improvements in water productivity would be required to make the process competitive with reverse osmosis for the desalination of seawater. (OWRT)
W76-03147

HIGH TEMPERATURE ELECTRODIALYSIS PHASE V,
Ionics, Inc., Watertown, Mass.
F. B. Leitz, M. A. Accomazzo, H. I. Viklund, and A. D. Jha.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 18- $5.00 in paper copy, $2.25 in microfiche. Office of Saline Water Report INT-OSW-RDPR-74-98 June 1974. 75 p, 43 fig, 6 tab, 7 ref. OSW 14-3- 3084.

Descriptors: *Desalination, *Seawater, *Brackish water, *Electrodialysis.
Identifiers: *Membrane conductivity, *Stack resistance, *Endurance tests, Thin membranes, Th spacers, Membrane backing.

The overall objective of this program is t development of improved electrodialys technology for water desalination. On previo contracts the effect of and means of obtaining tw process improvements: high temperature oper tion and use of thinner components were i vestigated. This phase has specifically dealt wi manufacture and shop testing of two stages ea of which consisted of 130 cell pairs of the n components. Further refinements were made the economic evaluation of such components f desalination of sea water. With reasonable a sumptions of economic parameters, total desali tion costs are estimated to be 16 to 24 cents per (60 to 90 cents per 1000 gals). (OWRT)
W76-03148

DEVELOPMENT OF CTA HIGH FLUX LO OPERATING PRESSURE R.O. MODULES,
Dow Chemical Co., Walnut Creek, Calif. Westi Div. Research Labs.
E. A. McLain.

vailable from the National Technical Informa-
n Service, Springfield, Va 22161 as PB-234 174,
.50 in paper copy, $2.25 in microfiche. Report
T-OSW-RDPR-74-984, June 1974. 49 p, 23 fig, 8
, 5 ref. OSW 14-30-3054.

escriptors: *Desalination, *Reverse osmosis,
lembranes, Hollow fiber, Cellulose triacetate,
ackish water, Waste water treatment.
ntifiers: *Module design, *Module construc-
n.

gh flux cellulose triacetate hollow fibers were
veloped for desalting brackish water at low
erating pressure. Multi-filament yarns contain-
uniform hollow fibers in the size range 180
crons to 250 microns O.D. and 60 microns to 90
crons I.D. were produced at spinning speeds in
range of 50 to 100 feet per minute. Fibers hav-
a flux of 3.0 GFD and a sodium chloride rejec-
n of 85% at 150 psi on 2000 ppm NaCl feed were
duced. The desirability of using standard PVC
e for low pressure R.O. module cases was ex-
red. A 30,000 GPD module design was made on
basis of test results. The module contains two
tridges within 14-1/2 inch diameter, filament
und, fiber glass reinforced plastic case. The
w mode through the two cartridges is radial
ible pass, the saline water flowing transversely
wardly across the fibers of one cartridge and
ardly across the fibers of the other. An operat-
pressure of 250 psi was selected. Productivity
s rated on the basis of one year's compaction. A
ection of 85% is guaranteed when the module is
rated at 50% water recovery from feed con-
ing 2000 ppm NaCl. (OWRT)
6-03149

**E PASS SEAWATER DESALINATION HOL-
W FINE FIBERS,**
v Chemical Co., Walnut Creek, Calif. Western
. Research Labs.
. Davis.
ilable from the National Technical Informa-
Service, Springfield, Va 22161 as PB-234 101,
0 in paper copy, $2.25 in microfiche. Office of
ne, Report INT-OSW-RDPR-74-983, June
. 40 p, 18 fig, 7 tab. OSW 14-30-3032.

criptors: *Desalination, *Reverse osmosis,
mbranes, Cellulose triacetate, Permeability,
water.
tifiers: *Molecular weight variations, Com-
ion resistance.

results of efforts to improve the performance
acteristics of cellulose triacetate hollow fiber
branes suitable for the single pass desalina-
of seawater are reported. Effects of the
ification of the spinning blend composition
processing variables upon the compaction and
eation of fibers developed under OSW Con-
14-30-2799 were investigated. The most en-
aging development is a 30 to 40% increased
r permeability without significant changes in
ejection, compaction rate, or alteration of the
production process. This improvement was
ved by an increase of the average molecular
ht of a polymeric plasticizer component,
ethylene glycol, used in the spinning blend.
e 8 inch reverse osmosis modules were
cated and tested on both brackish and sea-
r. One module produced potable water from
ater at 25% product recovery for the 3,300
s it was operated at the San Francisco Aquari-
est site and the OSW Test Facility in San
. (OWRT)
-03150

**SITU-FORMED CONDENSATION
YMERS FOR REVERSE OSMOSIS:
OND PHASE,**
n Star Research Inst., Minneapolis, Minn.
Cadotte, C. V. Kopp, Jr., K. E. Cobian, and
Rozelle.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 198, $5.50 in paper copy, $2.25 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-982, July 1974. 92 p, 21 tab, 18 fig, 29 ref. OSW 14-30-2883.

Descriptors: *Reverse osmosis, *Membranes, *Desalination, *Semipermeable membranes, Sea water, Permselective membranes, Thin films, Pressure, Separation techniques.
Identifiers: *Composition membranes, Ultrathin membranes, Interfacial polymerization, Porous polysulfone, In situ-formed membranes, Spiral wrap modules, Tubular modules, *NS-100 membrane composites, NS-200 membrane composites.

A new, highly promising membrane has been developed for single stage reverse osmosis seawater desalination. This membrane, designated NS-200, consists of furfuryl alcohol polymerized onto a microporous polysulfone support. This membrane has demonstrated very high salt rejections and water fluxes (an average of 99.74 plus or minus 0.15 percent at a water flux of 19.7 plus or minus 4.3 gfd in 35 tests using synthetic seawater feed at 1500 psi). Initial 500-hour tests in synthetic seawater indicate low flux decline properties. Preliminary tests showed these membranes to be resistant to 50 ppm chlorine at neutral pH's, IN HCl and boiling water. Infrared spectroscopic studies showed that the urea linkages were formed by the reaction of polyethylenimine (PEI) and tolylene 2,4-disocyanate (TDI). Also unreacted primary and secondary amine groups of PEI condensed (with elimination of ammonia) during the heat-cure step to form additional crosslinking. The average thickness of the PEI-TDI coating was found to be less than 2100 A. The membrane was found to reject organic solutes to a greater extent than any commercially available membrane. All but two of twenty-five organic solutes studies were rejected at 80 percent of greater. This membrane also was stable at temperatures up to 165F. The membrane was not resistant to chlorine concentrations of lppm. Extended term reverse osmosis testing (under the above conditions) of 1200 hours showed the membrane to exhibit water fluxes above 18 gfd at rejections greater than 99.4 percent. The membrane was found to be applicable to both spiral wrap and tubular reverse osmosis configurations. (OWRT)
W76-03151

FINAL REPORT--DETERMINING FEASIBILITY OF ALTERNATIVE APPROACHES OF OBTAINING SOLID-DRY BRINE EFFLUENT FROM DESALINATION PLANTS AT INLAND LOCATIONS,
Westinghouse Electric Corp., Lester, Pa.
S. Lemezis, C. J. Bowden, R. L. Pryor, and G. P. Chanko.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-233 072, $5.50 in paper copy, $2.25 in microfiche. Office of Saline Water Report INT-OSW-RDPR-74-971, May 1974, 109 p. OSW 14-30-2659.

Descriptors: *Desalination, *Brine disposal, *Desalination plants, Feasibility studies, Alternative water use, *Distillation, Waste water treatment.
Identifiers: Seeded slurry recycle, Blowdown.

The disposal of brine wastes that are generated from all known desalting processes is becoming a problem of major dimensions. Pollution control regulations being adopted by the various States and the Federal Government may well prevent use of the traditional methods such as deep-well injection or return of the concentrate to the original water source. This problem looms so large that the use of known desalination methods for deriving potable water from brackish supplies at inland locations may be severely limited. The process upon which our study is based is a specialized MSF evaporator plant operating on a seeded slurry recycle system. The contract specifies that this plant should treat blowdown from a conventional MSF plant initially desalting the specified waters. In an actual plant intended to purify the specified waters and reduce the blowdown to a solid residue, the basic MSF plant and the first loop of the processing plant should be combined into a single MSF train operating on a seeded slurry recycle system. (OWRT)
W76-03152

FUTURE APPLICATIONS OF DESALTING PROCESSES FOR REDUCTION OF INDUSTRIAL WATER POLLUTION,
Stanford Research Inst., Menlo Park, Calif.
C. W. Marynowski, C. F. Clark, and R. C. Phillips.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-225 124, $4.50 in paper copy, $2.25 in microfiche. Office of Saline Water Report INT-OSW-RDPR-73-898, June 1973. 55 p, 6 fig, 11 tab, 106 ref. OSW 14-30-3137.

Descriptors: *Desalination processes, *Applications methods, Economics, *Industrial wastes, Pollution abatement, Waste water treatment, Powerplants.
Identifiers: Fertilizer plants, Steel mill.

The purpose of this study was to examine the major water-using industries to identify several specific attractive applications of desalting processes, and to evaluate the technical and economic feasibility of the selected illustrative applications. Three applications analyzed in detail are relatively novel. One representing ion exchange treatment of ammonium nitrate plant wastes, is in use at a single plant; the second; representing evaporation of steel mill waste ammoniacal liquor, is being installed; and the third, representing the treatment of power plant stack gas scrubber blowdown by electrodialysis and evaporation, is conceptual. If they prove to be practical, similar processes could be widely adopted, creating new markets for desalination equipment and related facilities. Estimates are made of the capacity of wastewater treatment equipment that will be needed for effluent demineralization by selected industries, and the corresponding investment and operating expenses. Recommendations are made on the direction of research efforts needed to aid and implement the use of desalting techniques for reduction of industrial water pollution. (OWRT)
W76-03153

VERTICAL TUBE DISTILLATION DESALTING STATE-OF-THE-ART (1971),
Hittman Associates, Inc., Columbia, Md.
R. Blevitt, and H. M. Curran.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-224 277, $6.00 in paper copy, $2.25 in microfiche. Office of Saline Water Report INT-OSW-RDPR-73-896, November 1972. 142 p, 25 fig, 17 tab, 19 ref. OSW 14-01-001-1748.

Descriptors: *Desalination, Desalination apparatus, *Distillation, Economics, Cost analysis, *Reviews, Design, Performance, Desalination plants, *Evaporation.
Identifiers: *Vertical tube evaporators, Desalting economics.

The state-of-the-art design, performance, and economics of downflow thin film vertical tube evaporator (VTE) desalting plants were analyzed and reviewed. Both single- and dual-purpose plants ranging in size from 1 to 250 MGD capacity were evaluated. The VTE has been in use for some time, but its application in large scale desalting projects is only 10 years old. The largest U.S. commercial plant is 1 MGD (11 effects at a performance ratio of 9.3) and the largest experimental test bed is also 1 MGD (17 effects, performance ratio of 13.2). Designs ranging up to 250 MGD have

been prepared. Recent innovations include integration of multistage flash (MSF) preheaters with the VTE equipment yielding apparent economies in materials, fabrication, and operation. Current technology emphasizes the use of enhanced surfaces for improvement of evaporation/condensation heat transfer. Concrete lined steel appears to offer long term corrosion resistance to hot seawater brines. Current plants and designs yield from 0.75 to 0.85 pounds of product water per 1000 Btu (initial heating steam) per effect of concentration ratios of 2.5 to 3.0. Two and three inch diameter evaporator tubes of Al-brass or 90-10 CuNi currently are the most attractive materials. VTE desalting plants are currently undergoing continuous improvements in process configuration, materials of construction, and fabrication technology. These improvements are expected to yield reductions in desalting costs. (OWRT)
W76-03154

EVALUATION OF ANISOTROPIC, IONOGENIC MEMBRANES (DIAFLO UM-SERIES) FOR SELECTIVE REMOVAL OF DIVALENT CATIONS AND ANIONS FROM BRACKISH WATER BY REVERSE OSMOSIS,
Amicon Corp., Lexington, Mass.
H. Shathmann, R. A. Cross, T. R. Rich, and B. E. Carroll.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-223 702, $5.00 in paper copy, $2.25 in microfiche. Office of Saline Water Report INT-OSW-RDPR-73-894, October 1973. 81 p, 30 fig, 16 tab, 11 ref, append. OSW 14-30-2640.

Descriptors: *Desalination, Desalination plants, *Membranes, Membrane processes, Brackish water, *Reverse osmosis, Pilot plants, Cations.
Identifiers: Cellulose acetate, *Ultrafiltration membranes, Polyanion, Polycation.

A series of asymmetric membranes made from a polyelectrolyte complex resin has been evaluated by reverse osmosis tests for the selective removal of divalent ions from brackish waters. Three different types of membranes were studied. All three membranes were made from the same basic polymer, i.e., the reaction adduct of a polyanion (polysodium styrene sulfonate) and a Polycation (polyvinyl benzyltrimethylammonium chloride). During first phase of study, the membrane was tested over short time periods with single salt solutions. The second phase consisted of long term tests (ca. 1000 hrs.) to evaluate membrane compaction and fouling using brackish and sea water feeds. The product flux of all three membranes increased linearly with applied hydrostatic pressue up to 600 psig. The average flux increase per 100 psi pressure difference is about 20 gfd. Long term evaluation indicated that compaction was of the same order of magnitude as that observed with cellulose acetate membranes. The rejection of monovalent and divalent ions did not change significantly with time. (OWRT)
W76-03155

DESIGN, CONSTRUCTION, AND FIELD TEST EVALUATION OF A HOLLOW FINE FIBER MODULE,
Monsanto Research Corp., Durham, N.C.
T. A. Orofino, R. L. Leonard, J. C. Berry, T. E. Britt, and J. A. Carden.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-223 762, $5.00 in paper copy, $2.25 in microfiche. Office of Saline Water Report INT-OSW-RDPR-73-893, October 1973. 70 p, 6 fig, 7 tab, 5 ref, 7 append. OSW 14-30-2773.

Descriptors: *Desalination, Desalination plants, *Pilot plants, Membrane processes, Membranes, *Reverse osmosis, *Brackish water, Design.
Identifiers: *Hollow fine fiber modules, Double cartridge looped fiber, Double end seal cartridge, Radial flow cartridge.

A nominal 20,000 gpd hollow fiber module of single-cartridge, radial flow design was constructed and field-tested for three months at the Office of Saline Water, Roswell, N.M. test site. Preparatory work included detailed engineering and economic evaluation of two alternate, axial flow modules also of nominal 20,000 gpd productivity, and fabrication of an instrumented test loop to accommodate the unit finally built. The module evaluated at Roswell showed good flux stability throughout the test period, exceeding target performance with regard to module output and volumetric efficiency. Salt rejection remained at 90% target for the first forty days of continuous operation, declined slightly but abruptly on one particular occasion of feed interruption, and finally stabilized at 85% for the remainder of the test. Average performance between Day 31 and Day 90 of the three-month period was 23,200 gpd (70 F), 3.13 gfd (70 F), 6,840 gpd/ft3, and 86.7% rejection, operating at 300 psig and approximately 30% recovery from 3600 ppm Roswell No 1 feed. (OWRT)
W76-03156

FINAL ANNUAL REPORT-VERTICAL TUBE EVAPORATOR MULTISTAGE FLASH TEST BED PLANT, FREEPORT, TEXAS, APRIL 1, 1972 TO MARCH 31, 1973.
Bechtel Corp., San Francisco, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 399, $11.00 in paper copy, $2.25 in microfiche. Office of Saline Water Report INT-OSW-RDPR-74-999, (1973). 412 p, 113 fig, 35 tab, 4 append. OSW Contract 14-30-3060.

Descriptors: *Desalination plants, *Flash distillation, Evaporators, Heat transfer, Operations, Nozzles, Texas, Scaling, Treatment facilities, Waste water treatment.
Identifiers: Distributor nozzles, Freeport(Tex), *Vertical tub evaporators, VTE/MSF test plant(Desalting).

Volume I describes the second year of operation of the VTE/MSF Test Bed Plant at Freeport confirmed the overall operability of the coupled plant. The plant operates stably and recovers smoothly from upsets. The development program objectives were generally met. The following parameters affecting heat transfer coefficients in the doubly-fluted VTE tubes were investigated: temperature, heat flux, brine feed thermal quality, liquid loading, steam quality, venting. The plant operated for a total time of more than 11,000 hours during its two-year life. During the second year, a total of 207,422,000 gallons of water was produced, and the plant operated with a 70.2-percent onstream factor. The plant was shut down on March 23, 1973. At the present time there are no plans to continue its operation. Volume II is comprised exclusively of computer printouts of development runs. (OWRT)
W76-03157

WATER PURIFICATION MEMBRANES AND METHOD OF PREPARATION,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 5D.
W76-03171

CONTINUED STUDIES ON THE USE OF A MIXED CHROMATE-PHOSPHATE INHIBITOR IN DESALINATION SERVICE, FINAL REPORT,
Dow Chemical Co., Midland, Mich.
B. D. Oakes.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 977, $5.00 in paper copy, $2.25 in microfiche. OWRT/S-1976/9, November 1972. 77 p, 38 fig, 8 tab. OSW-14-01-0001-2150.

Descriptors: *Desalination, *Distillation, *Seawater, *Corrosion, *Water chemistry, Copper alloys, Steel alloys, *Inhibition.
Identifiers: Materials of construction.

Continued testing of a chromate-phosphate corrosion inhibitor developed for use in desalination systems made of mild steel and copper alloys show the inhibitor to look promising for use in large systems. Low levels of the inhibitor, 1 part per million (ppm) chromate plus 9 ppm phosphate, effectively control the corrosion of mild steel, stainless steels and copper alloys in small plants producing 2 to 3 thousand gpd of fresh water. This production is achieved at dissolved oxygen levels of from near zero to as high as 1 ppm. The method is potentially useful in new plants that would be entirely constructed of mild steel. It appears the method could also be used for existing plants experiencing excessive corrosion problems on copper and steel alloy surfaces. A practical solution to the scaling problem occurring with the inhibitor use has already been worked out. Other solutions undoubtedly exist. (OWRT)
W76-03190

NONMETALLICS - THEIR PERFORMANCE IN THE DESALINATION ENVIRONMENT,
Dow Chemical Co., Midland, Mich.
J. A. Manning, Jr., and S. V. Carleton.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 70 $7.75 in paper copy, $2.25 in microfiche. OWRT/-1976/6, April 1975. 289 p, 36 fig, 71 tab, 5 r OSW 14-30-3111.

Descriptors: *Desalination, *Distillation, *S water, Construction materials, *Corrosio *Protective coatings, Cements, Plastic pip Resins, Paints.
Identifiers: *Non metallics, Fiber reinforc plastics.

This report describes the testing of nonmeta materials of construction and their performance a desalting environment at the OSW Materi Test Center at Freeport, Texas. Of seventy-th paint and coating systems tested in treated water, sixty were considered satisfactory desalination plant service at 110F; only eight systems were rated as adequate at 250F. Ba phenolic or fludized bed-polyphenylene sulf types should be considered for high temperat operations. Nineteen fiber reinforced pla (FRP) laminate systems, thirteen thermopla types and fifteen commercial FRP piping syst were evaluated at regular intervals over a total posure period of fifteen months. Polysulfone an outstanding thermoplastic in 250F sea wa Prekrete (Trademark) G-8 was the only corro resistant cement found suitable for use in 250F water. (OWRT)
W76-03191

RELATIONSHIPS OF CORROSION RATES WATER CHEMISTRY IN THE FREEP TEST BED PLANT,
Dow Chemical Co., Midland, Mich.
J. A. Manning, Jr., S. V. Carleton, and C. F. Schrieber.
Available from the National Technical Info tion Service, Springfield, Va 22161, as PB-248 $5.50 in paper copy, $2.25 in microfiche. OWR -1976/7, June 1973. 111 p, 33 fig, 11 tab, 35 OSW 14-30-3080.

Descriptors: *Desalination, *Distillation, water, *Corrosion, *Water chemistry, *Coat Copper alloys, Steel alloys.
Identifiers: Materials of construction.

The corrosion rates in this report are actual c sion rates and not just relative values. Av corrosion rates based on coupon weight loss close agreement with instantaneous corr rates obtained by instrument. The oft-

astrophic corrosion rates obtained in an operat- plant when Dissolved Oxygen (DO), CO2, and are not properly controlled are discussed along h the detrimental effect of H2S on materials avior. High DO is the most detrimental en- nmental factor in the corrosion of copper and l. Instantaneous corrosion rate monitoring in- mentation is an excellent means of detecting n leakage and resultant high corrosion of steel copper alloys. Shutdowns and startups should minimized with a fresh water wash and drain owing shutdown. Corrosion rates during cyclic t chlorination were high. (OWRT)
5-03192

VELOPMENT OF VERTICAL TUBE FOAM APORATION FOR DESALINATION,
fornia Univ., Berkeley. Sea Water Conversion
I. Sephton.
ilable from the National Technical Informa- Service, Springfield, Va 22161, as PB-248 667, 0 in paper copy, $2.25 in microfiche. OWRT/S- 6/17, June 1975. 133 p, 65 fig, 21 ref. OSW 14- 559.

criptors: *Desalination, *Distillation, water, *Heat transfer, Surfactants, erfaces, Pilot plants.
tifiers: *Vertical tube evaporation, Foamy hase flow, *Fluted tubes, *Corrugated tubes, erface enhancement.

ertical tube evaporation (VTE) pilot plant ty capable of testing full-sized distillation in an 18-tube bundle to provide comparative under process conditions relevant to pro- d large plant operation, is described. Double- d and spiral-corrugated distillation tubes were d in the upflow mode with fresh water, brine eawater feeds. A novel, proprietary method ne-side enhancement was applied: The inter- enhancement method (1) produced overall heat transfer coefficient and distillate ctivity rate enhancements of up to 200 per- over and above VTE performance data ob- d with these enhanced tubes under compara- andard upflow process conditions. This inter- nhancement method depends upon the addi- f selected surfactants to the feed brine in a parts per million (ppm) concentration and establishing a foamy two-phase flow condi- ver the heat transfer surface. Overall heat er enhancements about 100 percent were lucibly demonstrated under realistic upflow conditions with both double-fluted and corrugated distillation tubes using seawater aving about 5 ppm of a fully biodegradable ercial surfactant added thereto. Simultane- beside pressure drop reductions by a factor g from 3 to 10, and significant upflow VTE zation effects were also demonstrated. T)
3256

ARCH AND DEVELOPMENT OF NS-1 RELATED POLYSULFONE HOLLOW S FOR REVERSE OSMOSIS DESALINA- OF SEAWATER,
outh Research Inst., New Orleans, La.
sso, E. Klein, and J. K. Smith.
ble from the National Technical Informa- rvice, Springfield, Va 22161, as PB-248 666, n paper copy, $2.25 in microfiche. Office of Research and Technology, OWRT/S-- July 1975. 145 p, 79 fig, 16 tab, 24 ref. 14- .

ptors: *Desalination, *Membranes, ity, *Reverse osmosis, Seawater.
ers: Composite membranes, Polysulfone, w fibers, Polyvinylpyrrolidone, NS-100, porous fibers, Polyethylene-imine.

fone hollow fibers for Reverse Osmosis ation of water were investigated. Parame- ters which influence fiber properties include spinning solution composition and viscosity, spinning temperature, solution pumping rates, choice of coagulation agents, coagulation temperature and nascent fiber drawing rate. The most satisfactory fibers were produced by wet-dry spinning of a solution containing polysulfone-polyvinylpyrrolidone-dimethylacetamide. Porosity, mean and maximum pore size, ultrafiltration rate, and void volume were measured. Macrovoids were observed to occur in the fibers according to variations in solution viscosity, quench media, and coagulation rate. The deposition of ultrathin coatings on polysulfone hollow fiber was studied extensively. Coating and bundle assembly techniques were found to affect the performence of composite reverse osmosis fiber. Preheat treatment led to an increase in the desalination ability of NS-1, a polyethylenimine-isocyanate coated polysulfone hollow fiber. (OWRT)
W76-03257

NEW POLYMERS FOR DESALINATION MEMBRANES,
O. Vogl.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 668, $4.00 in paper copy, $2.25 in microfiche. OWRT/S--1976/3, (1974). 43 p, 7 tab, 8 fig, 11 ref. 14-30-3146.

Descriptors: *Reverse osmosis, *Membranes, *Desalination, *Polymers.
Identifiers: *Asymmetric membranes, Casting variables, Polyamides, Glass transition, Water transport, Composite membranes, Copolyamides.

The objective of this project is the development of materials and techniques which will allow the formulation of membranes suitable for use in desalination by reverse osmosis. Major emphasis was placed on actual reverse osmosis testing of candidate materials and on obtaining a more thorough fundamental understanding of the physical properties of these materials. The major difficulty encountered in the fabrication of asymmetric membranes from copolyamides is their limited solubility in good casting solvents. In an attempt to overcome this problem, the effects of the incorporation of additional comonomers on the solubility and desalination performance of these materials were investigated. In addition, several new film-forming copolyamides were synthesized and characterized. (OWRT)
W76-03258

IN-SITU-FORMED CONDENSATION POLYMERS FOR REVERSE OSOMSIS MEMBRANES-FINAL REPORT,
Midwest Research Inst., Minneapolis, Minn. North Star Research Div.
J. E. Cadotte, K. E. Cobian, R. H. Forester, and R. J. Peterson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 670, $5.00 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, OWRT/S--1976/2, July 1975. 85 p, 23 tab, 16 fig, 17 ref. 14-30-2883.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, *Polymers, *Porosity.
Identifiers: *In-Situ Condensation, Salt rejection, Polysulfone, Water flux, Condensation polymers, Furfuryl alcohol, Polymethacrylate, Polyimadazopyrrolones, NS-100, NS-200, Chlorine stability.

A new, highly promising reverse osmosis membrane for single pass seawater desalination--NS-200--was developed. This membrane consisted of a sulfonated poly(furfuryl alcohol) resin deposited on a microporous polysulfone support. Fabrication was much simpler than for NS-100 membranes. Optimization of the NS-200 membrane fabrication parameters was carried out to yield a membrane with water flux of about 20 gfd at 99.9 percent salt rejection when operated on synthetic seawater at 1500 psig and 25C. This membrane was more durable than NS-100 during handling, was operable in the pH range of at least 3.2 to 9.4, was very effective in rejecting inorganic salts, urea, and boric acid, and was not subject to membrane compaction under high pressures. Tests of 1000 hours duration with synthetic seawater were highly successful. Both the NS-200 membrane and the previously developed NS-100 demonstrated excellent resistance to chloramine as the feed stream sterilizing agent, but not to hypochlorite. (OWRT)
W76-03259

3B. Water Yield Improvement

A LABORATORY INVESTIGATION OF THE EFFECT OF SURFACE FILMS ON WIND INDUCED REAERATION,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W76-03100

HANDBOOK OF APPLIED WEATHER MODIFICATION, PART 1. COLD CLOUD MODIFICATION SUBSYSTEM, VOLUME 1. CUMULUS CLOUD TREATMENT.
Naval Weapons Center, China Lake, Calif. Research Dept.
Available from the National Technical Information Service as AD-A 007 333, price 4.50 Report NWC TP 5160, Part 1, Volume 1, February 1975. 54 p, 27 fig, 1 tab, 11 fef.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, Precipitation(Atmospheric), Cloud physics, Equipment, Aircraft, Nucleation, Silver iodide, Clouds, Rainfall, Meteorology.
Identifiers: Cumulus clouds, Pyrotechnic cloud seeding, Aerial cloud seeding, Weather modification equipment.

The stimulation of rainfall by seeding cumulus clouds with silver iodide has been investigated extensively since the ice-nucleating properties of these crystals were discovered in 1947. Since that time techniques to dispense silver iodide into supercooled clouds have improved to a point where investigators, particularly those using dynamic methods of cloud seeding from aircraft, are having considerable success in augmenting precipitation and some success in inhibiting precipitation. Generally, modifiable clouds fall within the classification categories of cumulus or stratus cloud types. Factors controlling the type and degree of cumulus development were discussed, and explanatory diagrams were presented. Unsheared cumulus clouds are seeded by emplacement of glaciogenic (ice-producing) nuclei in updrafts at or near the top of those clouds in the warmest temperature zone at which the nucleant is effective. Sheared clouds are seeded in updrafts on the upshear side at the effective temperature level. Techniques useful for seeding cumulus clouds with glaciogenic nuclei for rain augmentation were discussed. Airborne devices the Navy uses to modify cold cumulus clouds were described. External and internal properties of both the family of pyrotechnic catalyst generator cartridges and the SUU-53/A cartridge dispenser were delineated. The safety features of these devices were especially emphasized. (Sims-ISWS)
W76-03101

AN EVALUATION OF WEATHER MODIFICATION ACTIVITIES IN THE TEXAS HIGH PLAINS,
Texas A and M Univ., College Station. Center for Applied Geosciences.
J. R. Scoggins, P. Das, J. F. Griffiths, H. O. Hartley, and R. D. Lacewell.

Texas A and M Univ., College Station. Center for Applied Geosciences.

Descriptors: *Cloud seeding, *Weather modification, Texas, Cotton, Statistical methods, Rainfall, Hail, Radar, Thunderstorms, Numerical analysis, Evaluation.
Identifiers: *Texas high plains, Crop damage, Crop loss.

This report results of a study to evaluate the effectiveness of cloud seeding in the Texas High Plains for the months of May through October during the 4-yr period 1970-73. The effects of seeding were examined on rainfall graphically, and on both rainfall and hail by the analysis of variance method and the chi-square goodness-of-fit test. The amount of damage to cotton was taken as the primary indicator of weather damage. Statistical analysis of rainfall data indicated that cloud seeding does not influence rainfall. Also, a statistical analysis of cotton losses attributable to hail and insurance damages paid due to hail damage on cotton indicated that the hail suppression program did not significantly affect cotton hail damage. The outline of an operational, one-dimensional, numerical model of hail-producing thunderstorms was developed to study the possibility of predicting the occurrence and severity of hailstorms. No. relationship could be ascertained between radar-echo coverage and such severe-weather phenomena as hailstorms, tornadoes, and funnel clouds. The limitations of the data were given. (Jones-ISWS)
W76-03104

C. E. JACOB'S STUDY ON THE PROSPECTIVE AND HYPOTHETICAL FUTURE OF THE MINING OF THE GROUND WATER DEPOSITED UNDER THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4B.
W76-03363

3C. Use Of Water Of Impaired Quality

EFFECT OF IRRIGATION ON SOME PHYSICOCHEMICAL PROPERTIES OF CISCAUCASIAN CHERNOZEMS OF THE SECOND TERRACE OF THE DON RIVER, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR). Research Inst. of Biology.
A. Ya., Vigutova, E. F. Ryazanova, V. G. Movchan, and G. N. Shevtsova.
Izv Sev-Kavk Nauchn Tsentra Nyssh Shk Estestv Nauki. 2(3): 22-25. Illus. 1974.

Descriptors: *Irrigation, *Chernozems, Rivers, Aggregates, Salinity, *Saline soils, Terracing.
Identifiers: Ciscaucasian. Physiochemical conditions, Solonetzification, *USSR(Don River).

The degree and character of changes of the physicochemical properties and salt regime of Ciscaucasian chernozems of the second terrace of the Don River (USSR) irrigated for 20 yr is compared with unirrigated soils. Irrigation did not have a significant effect on the texture of the soils, unit weight and porosity, but some tendency toward an increase of density and decrease of porosity of the upper 0.5-m layer of soil was noted. The changes in the texture of the irrigated soils relative to the unirrigated were displayed by a decrease in the content of agronomically valuable aggregates and a decrease in their water stability. The seasonal dynamics of the salt regime of the irrigated and unirrigated soils are presented and factors causing salinization and solonetzification of irrigated soils are pointed out. --Copyright 1975, Biological Abstracts, Inc.
W76-03022

THE USE OF ALCOHOL DISTILLERY-GENERATED WASTE WATERS FOR IRRIGATION (ISPOL' ZOVANIYE STOKOV SPIRTOZAVODOV DLYA OROSHENIYA),
For primary bibliographic entry see Field 5D.
W76-03083

EFFECTS OF GRAZING ON INFILTRATION RATES IN WASTE WATER SPRAY FIELDS,
Agricultural Research Service, Morgantown, W. Va. Plant Science Div.
For primary bibliographic entry see Field 5D.
W76-03124

WATER QUALITY, FOUNTAIN AND JIMMY CAMP VALLEYS, COLORADO, 1973,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-03404

3D. Conservation In Domestic and Municipal Use

URBAN WATER USE IN AUSTRALIA,
Gutteridge, Haskins and Davey Pty. Ltd., Melbourne (Australia).
For primary bibliographic entry see Field 6D.
W76-03272

HOUSEHOLD TECHNOLOGY AND THE DOMESTIC DEMAND FOR WATER,
National Institute of Economic and Social Research, London (England).
For primary bibliographic entry see Field 6D.
W76-03278

3E. Conservation In Industry

ENERGY DEMAND AND WATER RESOURCE MANAGEMENT: SOME ECONOMIC ASPECTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6D.
W76-03003

ECOLOGY, ECONOMY AND MINING IN VERMONT,
For primary bibliographic entry see Field 5G.
W76-03061

UNCONVENTIONAL NUCLEAR POWER PLANT SITING OPTIONS AND WATER RESOURCE IMPACTS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W76-03135

ENERGY DISSIPATOR AIDS FIGHT AGAINST HIGH PRESSURE PROBLEMS.
For primary bibliographic entry see Field 4B.
W76-03212

MUNICIPAL WASTEWATER PLANT PROBLEMS WITH CYANIDE EFFLUENT REGULATIONS,
Metropolitan Sanitary District of Greater Chicago, Ill. Industrial Waste Div.
For primary bibliographic entry see Field 5D.
W76-03247

EFFLUENT CHARGES, ENVIRONMENTAL QUALITY AND OTHER NATIONAL GOALS: A QUALIFICATION,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-03268

A SOCIOLOGICAL ASSESSMENT OF ECONOMIC INCENTIVES FOR INDUSTRIAL POLLUTION ABATEMENT,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-03269

FINANCIAL INCENTIVES AND POLLUTION CONTROL. A CASE STUDY,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-03270

ENVIRONMENT LAWS MAY CLOSE MANY USA FISH FACTORIES.
For primary bibliographic entry see Field 5G.
W76-03273

DEEPSEA MINERAL UTILIZATION, REGULATION AND ECONOMIC EFFICIENCY,
Delaware Univ., Newark. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W76-03275

REALITY AND PROSPECTS OF THE FISHING INDUSTRY IN ITALY,
A. Bassi.
Review of the Economic Conditions in Italy, V 19, No 1, p 15-23, 1975.

Descriptors: *Marine fisheries, *Foreign countries, Commercial fishing, Fish handling facilities, Boats, Government supports, Fish harvest, Africa, Employment, Water rights, International waters, Foreign waters, Jurisdiction, Marketing, Atlantic Ocean.
Identifiers: *Italy, Mediterranean Sea, Territorial waters.

The Italian fishing industry has grown in recent years with the assistance of government support. Revised laws have helped clear up some of the technical aspects of fishing. There are 4 Mediterranean fishing vessels, 60 ocean vessels and 16,000 motorboats, which harvest 350,000 tons of fish a year. The Mediterranean fishing equipment has been modernized, fishing fleets reconstructed, new jobs created, and many economic benefits provided to fishermen. As some African countries have extended their territorial waters Italian trawlers have had to seek other fishing shoals; some have been found along the coasts of South Africa and North America but requiring expeditions of 150-160 days instead of 40-50 days. The Italian government must seek an international agreement on fishing rights and privileges. A fleet of 110 larger modern ships is proposed. A coordinated plan of incentives for restructuring Italian fishing is necessary by involving fishermen and those in processing, preserving, and distributing fish. New harbors, improved refrigeration facilities, promotion of Mediterranean and frozen fish, and effective fishermen's cooperatives would enhance the economic potential of the industry. (Buchanan-Davidson--Wisconsin)
W76-03279

COMPARATIVE RIST-COST-BENEFIT STUDY OF ALTERNATIVE SOURCES OF ELECTRICAL ENERGY. APPENDIX A: ENERGY EXPENDITURES ASSOCIATED WITH ELECTRIC POWER PRODUCTION BY NUCLEAR AND FOSSIL FUELED POWER PLANTS.
Division of Reactor Research and Development (USERDA), Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-03281

AN APPLICATION OF DISCRIMINANT ANALYSIS TO DETERMINE THE DEMAND FOR INDUSTRIAL FLOOD PLAIN LOCATION,
Missouri Univ., St. Louis. School of Business Administration.
For primary bibliographic entry see Field 6F.
W76-03283

CHANGING WATER USE IN SELECTED MANUFACTURING INDUSTRIES,
National Bureau of Economic Research, Inc., Washington, D.C.
. A. Leone, J. R. Ginn, and A-L. Lin.
vailable from the National Technical Information Service, Springfield, Va 22161 as AD/A-003 54, $6.75 in paper copy, $2.25 in microfiche. rmy Engineer Institute for Water Resources Report No IWR 74-10, October 1974. 164 p, 12 fig, 26 b, 6 ref, 1 append. DACW 31-72-C-0044.

escriptors: *Water demand, *Water utilization, ndustrial water, *Sites, Technology, Industries, ater reuse, Industrial production, Transportaon, Water costs, Elasticity of demand, Regional evelopment, Planning, Coasts, Inland waterays, Relocation.

ecently major shifts in industrial water use chnology have occurred. Several factors are inlved: Modernization of technological processes new plants; changes in water prices as reflected changes in availability and quality; and stricter ter pollution controls. This study was designed help understand the effect of some of the anges in water cost and quality on technological anges in process design and plant location decions. A study of steel, pulp and paper, petroleum ining, chemical, aluminum and blast furnaces licated that water is a necessary but not a suffint condition for continued growth in waterng industries. Geographic patterns of industry ation seemed to be shifting toward areas with orable water resources but there is considerachange in water use over time. Water for indusl processing is not a major location determint; rather water for transportation is a more imtant location determinant. Industrial demand water is far from inelastic in the range of price nges being experienced. There appear to be ar trade-offs between water-use and more ital extensive process designs. Using cross-sec- sample data on water use in individual manuturing plants, a statistically significant relation- between water cost and water demand was nd, with demand elasticities of 0.5-1.0. chanan-Davidson--Wisconsin)
6-03284

TERDEPENDENCE OF AIR, WATER, AND L POLLUTION CONTROL STRATEGIES IN OWER PLANT AND A KRAFT MILL,
telle Columbus Labs., Ohio.
primary bibliographic entry see Field 5D.
5-03297

E RECOVERY OF FE, MN AND AL FROM A E WATER EFFLUENT,
hefstroom Univ., for C. H. E. (South Africa).
t. of Industrial Chemistry.
primary bibliographic entry see Field 5G.
-03312

SENT AND FUTURE REQUIREMENTS OF CHLOR-ALKALI INDUSTRY FOR EFFEC- E POLLUTION CONTROL,
vford and Russel, Inc., Stamford, Conn.
primary bibliographic entry see Field 5D.
-03497

USTRIAL REQUIREMENTS FOR EFFEC- POLLUTION CONTROL. AUTOMOBILE USTRY,
ral Motors Corp., Warren, Mich. Environal Activities Staff.

For primary bibliographic entry see Field 5G.
W76-03498

3F. Conservation In Agriculture

TIME-DEPENDENT LINEARIZED INFILTRATION: II. LINE SOURCES,
Arizona Univ., Tucson. Dept. of Mathematics.
For primary bibliographic entry see Field 2G.
W76-03007

SOLUTION TO THE ONE-DIMENSIONAL LINEAR MOISTURE FLOW EQUATION WITH WATER EXTRACTION,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W76-03008

DRIP IRRIGATION SYSTEM,
Andco Inc., Buffalo. N.Y. (Assignee).
R. W. Hildebrandt, and H. Hanks, Jr.
U S Patent No 3,917,174, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 263, November 4, 1975.

Descriptors: *Patents, Irrigation, *Surface irrigation, *Distribution systems, Irrigation practices, Irrigation systems, Irrigation efficiency, Water control, Water distribution(Applied), Flow control.
Identifiers: *Drip irrigation.

An irrigation system comprises: a main supply line for conveying fluid under pressure; a feeder tube having head end connected to the main supply line; control means connected to the feeder tube adjacent the head end for controlling the flow rate of fluid through the feeder tube; means maintaining the fluid at a predetermined pressure at the head end where by a decreasing pressure gradient exists from the head end of the feeder tube towards the downstream end during flow of fluid; and a plurality of emitters of varying flow capacities connected to the feeder tube downstream of the flow rate control. The emitters have relatively lower flow capacities connected to the feeder tube at the head end portion with emitters having progressively relatively higher flow capacities being connected to the feeder tube at respective locations progressively closer to the downstream end of the feeder tube so that substantially equal amounts of fluid are delivered to the plant root areas. (Sinha-OEIS)
W76-03010

DESIGN OF DRIP IRRIGATION MAIN LINES,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W76-03160

DESIGN OF IRRIGATION RUNOFF RECOVERY SYSTEMS,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
G. E. Stringham, and S. N. Hamad.
Journal of the Irrigation and Drainage Division Proceedings of ASCE, Vol 101, No IR3, p 209-219, September, 1975. 2 fig, 5 ref.

Descriptors: *Irrigation, *Mathematical models, *Design criteria, Water reuse, Runoff irrigation water, Agricultural runoff, Storage requirements.
Identifiers: Irrigation runoff, *Irrigation Runoff Recovery System.

The design of an Irrigation Runoff Recovery System (IRRS) is described and evaluated. Using this system, the need for a cut-back type of irrigation is eliminated by the use of a constant supply stream discharge, a constant discharge from the recirculating pump, a constant furrow discharge, and a constant number of furrows in each set. In order to adjust the set size and furrow discharge rates to accomodate the intermittent flows from recirculating pumps, a design technique has been developed that permits a constant inflow to all furrows of the irrigation, with no net runoff from the field. This is achieved by irrigating the entire set of irrigation fields from the inflow water and collecting the runoff in a storage reservoir. All of the remaining sets, except the last set, are irrigated by both the supply stream and runoff water, recirculated by pump. The last set is irrigated only from the stored runoff water. Thus the layout calls for n + 1 irrigation sets, and at the end, no water should remain in the storage reservoir. This technqiue allows planners to determine the number of furrows to irrigated from the supply and pumped streams, the number of sets and furrows in each, the volume of storage required in tht storage reservoir, and the recirculating pump flow rates. (Kramer-FIRL)
W76-03246

ECONOMIC ANALYSIS OF WHEAT PRODUCTION WITH FERTILIZER UNDER ADEQUATE AND LIMITING IRRIGATION WATER,
Central Arid Zone Research Inst., Jodhpur (India).
K. L. Ram, and A. N. Lahiri.
Indian Journal of Agricultural Research, Vol 8, No 1, p 25-36, 1974. 3 fig, 12 tab.

Descriptors: *Cost-benefit ratio, *Fertilization, *Irrigation, *Return(Monetary), Crop response, Wheat, Asia, Profit, Equations, Optimization.
Identifiers: *India.

The economics of fertilizer induced productivity in experimental wheat crops at Jodhpur, India, both under high and low irrigation levels was examined. The importance of water as an agricultural input, and its efficient utilization in areas where there is a water shortage for irrigation are discussed. Although results indicated that reasonably high wheat production may be achieved under low water conditions by the suitable addition of fertilizer considerations of the economics of fertilizer induced productivity in these conditions would help to formulate a policy about utilization of water resources in smaller areas for intensified production, or alternately, the advantages of diverting water resources over larger areas for cropping. Results revealed wheat production with adequate irrigation and optimum doses of fertilizer of 171.29 kg/ha nitrogen and 131.46 kg/ha superphosphate produced a crop response of 38.29 quintal/ha while under limited moisture conditions, the optimum doses of fertilizer will be 80.12 kg/ha nitrogen and 88.44 kg/ha superphosphate with the maximum crop response of 14.20 quintal/ha. At wheat prices of 90 rupees per quintal the net return over fertilizer cost would be 2668.50 rupees under irrigated conditions and 861.29 rupees under dry conditions. (Auen-Wisconsin)
W76-03277

DYNAMIC SIMULATION OF WATER STORAGE IN FALLOW SOIL AS AFFECTED BY MULCH OF HYDROPHOBIC AGGREGATES,
Texas A and M. Univ., College Station. Dept. of Soil and Crop Sciences; and Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 2G.
W76-03365

RELATIONSHIPS BETWEEN THE HYDRAULIC CONDUCTANCE OF SURFACE CRUSTS AND SOIL MANAGEMENT IN A TYPIC HAPLUDALF,
Soil Survey Inst., Wageningen (Netherlands).
For primary bibliographic entry see Field 2G.
W76-03366

MONITORING AGRICULTURAL POLLUTION USING NATURAL FLUORESCENCE,
Saskatchewan Research Council, Saskatoon.
For primary bibliographic entry see Field 5A.
W76-03387

HYDROLOGY OF THE SOUTH PLATTE RIVER VALLEY, NORTHEASTERN COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-03398

ANALOG MODEL STUDY OF THE HYDROLOGY OF THE SAN LUIS VALLEY, SOUTH-CENTRAL COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-03403

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

PROCEEDINGS OF THE CONFERENCE ON INTERDISCIPLINARY ANALYSIS OF WATER RESOURCE SYSTEMS.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6A.
W76-03005

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
B. C. Yen, and A. S. Sevuk.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 101, No EE4, Proceedings Paper 11503, p 535-553, August 1975. 4 fig, 5 tab, 15 ref, 2 append. OWRT B-043-Ill(10) and C-A/23(9023)(2). 14-31-0001-3078, and 14-31-0001-9023.

Descriptors: *Urban drainage, *Urban hydrology, *Storm drains, *Model studies, *Computer models, *Design, Urbanization, Routing, Sewers, Storm runoff, Urban runoff, Runoff, Storm water, Floods, Drainage, Environmental engineering, Hydraulic design.
Identifiers: *Illinois Storm Sewer System Simulation(ISS) Model, *Storm Water Management Model(SWMM), *Chicago method, *Steady-flow routing, *Kinematic-wave model, Retention storage.

Five methods for design of storm and combined sewers were compared by determining the size of the sewers of an example network. The Illinois Storm Sewer System Simulation (ISS) Model appears to be the most accurate method suitable for large expensive networks, and can also be used to study on-line retention storage. The conventionally used steady-flow routing method with shifting of hydrographs due to sewer flow time is simple and does not require use of a computer; thus it can be used for small networks and when high accuracy is not required. The version of steady-flow routing method without time shifting of hydrographs is not recommended because it consistently gives overdesign. The Chicago method provides no improvement in design and yet is more complicated than the time-shifting version of steady-flow routing method. The EPA Storm Water Management Model and the kinematic-wave model are improvements over the steady-flow routing method. They can be used for large networks but presumably are less accurate than the ISS Model. (Bender-ISWS)
W76-03006

HARVESTING AS A CONTROL FOR AQUATIC PLANTS,
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 5G.
W76-03058

METEOROLOGICAL AND HYDROLOGICAL DATA REQUIRED IN PLANNING THE DEVELOPMENT OF WATER RESOURCES (PLANNING AND DESIGN LEVEL),
World Meteorological Organization, Geneva (Switzerland).
V. G. Andrejanov.
Operational Hydrology Report No 5, WMO-No 419, 1975. 45 p, 1 tab, 57 ref.

Descriptors: *Streamflow, *Hydraulic structures, *Meteorological data, *Hydrologic data, Climatic data, Flow, Flow rates, Runoff, Water levels, Precipitation(Atmospheric), Rainfall, Dams, Bridges, Rivers, Low-flow frequency, High flow, Hydraulics, Hydrology, Data processing.

This report was devoted to a discussion of the methodology for calculating meteorological and hydrological characteristics and parameters and to methods of calculating individual elements of the hydrometeorological regime; it also contained a summary of the characteristics and parameters required in the planning of various structures and measures for various types of water resource use. (Sims-ISWS)
W76-03103

WATER SUPPLIES FOR LOW-INCOME COMMUNITIES IN DEVELOPING COUNTRIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-03114

ATMOSPHERIC REAERATION IN A RIVER USING PRODUCTIVITY ANALYSIS,
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5G.
W76-03115

SOUTH PLATTE RIVER FLOW CORRELATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-03117

FEEDBACK FROM FIELD STUDIES OF HYDRAULIC DREDGES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W76-03122

RESERVOIR MANAGEMENT MODELS,
Yale Univ., New Haven, Conn. School of Organization and Management.
M. J. Sobel.
Water Resources Research, Vol 11, No 6, p 767-776, December 1975. 9 tab, 51 equ, 27 ref.

Descriptors: *Reservoir storage, *Control, *Water policy, *Management, *Optimization, *Reservoir releases, *Stochastic processes, Economics, Design, Decision making, Dynamic programming, Algorithms, Equations, Mathematical models, Operations research, Linear programming.
Identifiers: Reservoir capacity, Discrete time, Linear decision rule, Chance-constrained programming, Deterministic models, Multiple-reservoir systems, Multi-item inventory systems, Cost minimization, Monotone policies.

The optimal policies for several discrete control models of reservoir storage are characterized. Most of the models are stochastic, and they prompted by operating problems of regulating amounts of water discharged from reservoirs. design problem of selecting reservoir capacity duces two models herein, one of them being de ministic. Each characterization is exploited to plify the numerical solution of heretofore form ble problems. Some of the results exploit analo between multi-item inventory theory and syst of multiple reservoirs. In particular, it is obse that the 'linear decision rule' label in the w resource literature ordinarily arises in cont where either (1) a myopic policy is optimal, or multiple-reservoir optimal release policy, function of the vector of reservoir contents, sesses a Jacobian matrix whose values between zero and one. Either (1) or (2) impres ly reduces the computational burden that w otherwise be carried. (Bell-Cornell)
W76-03162

INTERVENTION ANALYSIS IN WA RESOURCES,
Waterloo Univ., (Ontario). Dept. of Civil gineering.
For primary bibliographic entry see Field 2E.
W76-03165

USE OF RISK PREMIUMS IN CHANCE-STRAINED DYNAMIC PROGRAMING,
New South Wales Univ., Kensington (Aust School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W76-03166

ESTUARY TO BE STUDIED AS D.C. W SOURCE,
Illinois State Univ., Normal. Coll. of A Science and Technology.
For primary bibliographic entry see Field 5F
W76-03208

DESIGN OF IRRIGATION RU RECOVERY SYSTEMS,
Utah State Univ., Logan. Dept. of Agric and Irrigation Engineering.
For primary bibliographic entry see Field 3F
W76-03246

RESEARCH NEEDS FOR WATER RESOU CONTROL IN CALIFORNIA.
California State Water Resources Control Sacramento. Div. of Planning and Research
For primary bibliographic entry see Field 5C
W76-03265

RESOURCE ALLOCATION UNDER U TAINTY,
California Univ., Berkeley. Graduate Sc Public Policy.
For primary bibliographic entry see Field 6
W76-03266

TWO DECADES OF FLOOD-PLAIN MA MENT: THE TVA REGIONAL EXPERIE
Tennessee Valley Authority, Knoxville Flood Relations.
For primary bibliographic entry see Field 6
W76-03271

ATTEMPTS AT A COMPARATIVE EC ANALYSIS OF FAGUS-ABIES FORE THE SWISS JURA MOU (WEISSENTIEN AND CHASSERAL), (MAN),
J. Pfadenhauer.
Veroeff Geobot Inst Eidg Tech Hoch Reubel Zyer, 50, p 5-60, 1973, Illus. Eng mary.

Descriptors: *Forests, Analysis, Climates, Soils, Precipitation(Atmospheric), Winds.
Identifiers: Abies, Chasseral, Fagus, Jura mountains, Weissentein, Meteorological parameters.

Meteorological parameters were measured across a transect from N to S at Chasseral and on the side of Weissenstein. Three main plant forest communities were distinguished and analyzed: Fagetum abietosum, Abieti-Fagetum, and Aceri-Fagetum. Air temperature constitutes the decisive factor in the vertical distribution of the communities. Local variants were conditioned by soil and precipitation. The vertical limits of growth of Abies cannot be defined climatically. Cold-humid climates exclude Abies, e.g. because of snow breakage. The horizontal component of precipitation is discussed separately. In strongly wind-exposed stations the horizontal component may reach 60% of the vertical one.--Copyright 1974, Biological Abstracts, Inc.
W76-03274

RUNOFF MEASUREMENT IN SMALL CATCHMENT AREAS: REGISTRATION AND REPRESENTATION OF DATA, (IN NORWEGIAN),
Norges Landbrukshoegskole, Vollebekk.
For primary bibliographic entry see Field 2E.
W76-03280

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA REPORT FOR THE FISCAL YEAR JULY 1, 1973 TO JUNE 30, 1974.
Southern California Metropolitan Water District, Los Angeles.
1974, 212 p, 17 fig, 47 tab.

Descriptors: *Projects, *Met. Water Dist. of So. Cal., *California, *Water distribution(Applied), Financing, Electric power demand, Hydroelectric plants, Bond issues, Water transfer, Mexican Water Treaty, Desalinization plants, Cost analysis, Right-of-way, Tax rates, Colorado River, Colorado River Aqueduct, Cooling water, Nuclear powerplants, Reservoirs, Water storage, Salinity, Energy, Power, Chlorine, Operation and maintenance, Distribution systems, Water treatment, Engineering, Construction, Hydrography, Legal aspects, Economics.

The Metropolitan Water District of Southern California annual report for the fiscal year ending June 30, 1974, shows that a total 1,248,287 acre-feet of water were delivered to member agencies from the Colorado River and the California Aqueduct. A program was adopted to achieve a 1150 blend of water from the Colorado River and Northern California by 1976 to reduce salinity. The District agreed to supply cooling water to nuclear power plants in the eastern Mojave Desert and the San Joaquin Valley. Reservoirs in the State Water Project increased their reserve water storage thus enhancing recreational use. A salinity control bill for the Colorado River was signed by President Nixon, which should improve relations with Mexico and relieve salinity problems in the Colorado River Basin. The bill also authorized the construction of a 100 mgd desalting plant to treat agricultural return flow. Nearly $39 million in major projects were completed during the year. Composition of the District, assessed property valuations, populations, area, and cost analysis figures are presented. Operation and maintenance of the Colorado River Aqueduct and the distribution system, water treatment, engineering, State Water Project, construction, hydrography, legal, purchasing, personnel, rights-of-way, and finances are discussed. (See W76-03286 thru W76-03295) (Buchanan-Davidson--Wisconsin).
W76-03285

COLORADO RIVER AQUEDUCT OPERATION AND MAINTENANCE.
In: The Metropolitan Water District of Southern California report for the fiscal year July 1, 1973 to June 30, 1974, p 1-9, 5 tab.

Descriptors: *Met. Water Dist. of So. Cal., *Pumping, *Colorado River Aqueduct, *Operation and maintenance, *Electric power costs, *California, Mexican Water Treaty, Water transfer, Mexico, Pumping plants, Reservoir storage, Electric power demand, Radio communications systems, Transmission(Electrical), Electric power rates.
Identifiers: Solar salt operations.

Flow through the Colorado River Aqueduct, California, averaged 1655 cfs or an output of 7-8 pumps. In February flow was reduced for Lake Skinner inlet maintenance and preventing Lake Mathews storage from exceeding the winter maximum. Emergency diversion of Mexican Treaty water through the aqueduct to Tijuana continued; Mexico paid $584,774 for 8702 acre-feet of water. Preventive maintenance of pumps and control equipment was performed. Security gates were installed and fencing extended. Aqueduct maintenance included repairing drainage ditches, fences, roads, and buildings; cleaning sandtraps and trash racks; chemically retarding algae, mechanically removing algae, and cultivating tamarish trees for sand drift control. Solar salt operations were conducted at Danby Dry Lake. The radio communication system included 189 mobile and portable units and 12 base stations. The pumping load required purchase of 2,430,204,365 kwh during the year. A total of 1,476,224,580 kwh of Hoover and Parker energy was purchased to pump 727,500 acre-feet of Colorado River Water. Edison provided standby electric generating capacity. The electric energy rate for offpeak power purchased from Edison increased from 8.506 to 16.688 mills/kwh. Non-firm energy from the Bureau of Reclamation Glen Canyon Power Plant was purchased in lieu of Edison energy at 22% savings. (See also W76-03285) (Buchanan-Davidson--Wisconsin)
W76-03286

DISTRIBUTION SYSTEM OPERATION AND MAINTENANCE.
In: The Metropolitan Water District of Southern California report for the fiscal year July 1, 1973 to June 30, 1974, p 11-31, 2 fig, 7 tab.

Descriptors: *Met. Water Dist. of So. Cal., *Distribution systems, *Operation and maintenance, *Colorado River, *California, Tunnels, Canals, Pipelines, Reservoirs, Treatment facilities, Domestic water, Municipal water, Agriculture, Groundwater recharge, Saline water barriers, Algae control, Water rates, Chlorine, Repairing, Cleaning, Conduits, Water delivery, Water distribution(Applied).

The distribution system for conveying Colorado River and State Project water consisted of over 600 miles of tunnels, canals, and pipelines; nine reservoirs; three treatment plants; and numerous regulating structures for delivery of wholesale water for domestic, municipal, agricultural, and groundwater replenishment purposes and for injection underground for sea water barrier projects. Water sales totaled 1,248,287 acre-feet. A Chemical Unloading Facility for chlorine transfer was completed in April 1974, near the Val Verde Tunnel. The San Joaquin Reservoir was repaired and the San Jacinto Reservoir prepared for abandonment. Several reservoirs, feeders, and pipelines were temporarily shutdown or dewatered for repairs or cleaning. The distribution system was enlarged by activating new service connections to serve more consumers. Tables give descriptions of the distribution system conduits, their cost, and completion date. Monthly water deliveries for the fiscal year 1973-1974 and yearly figures for the past 33 years are given for untreated or softened and filtered Colorado River and State Project water. The price of water per acre-foot, water production of constituent areas of the Metropolitan Water District, and water used for underground replenishment are also shown. (See also W76-03285) (Buchanan-Davidson--Wisconsin).
W76-03287

WATER TREATMENT.
In: The Metropolitan Water District of Southern California report for the fiscal year July 1, 1973 to June 30, 1974, p 33-61, 7 fig, 10 tab.

Descriptors: *Met. Water Dist. of So. Cal., *Water treatment, *Colorado River Aqueduct, *California, Operation and maintenance, Algal control, Treatment facilities, Filtration, Water softening, Chlorination, Pilot plants, Methodology, Sludge disposal, Coliforms, Coagulation, Sampling, Ion exchange, Chemical properties, Reverse osmosis, Dissolved solids, Organic matter, Flow rates, Silicates, Cation exchange, Water quality, Corrosion, Taste, Odor, Repairing, Electric power, Water delivery, Hardness(Water).

Colorado River water from Lake Mathews was treated at the Weymouth Memorial Softening and Filtration Plant and Diemer Filtration Plant. State Project water from Castaic Lake was treated at the Jensen Filtration Plant. Chlorination, polyelectrolytes, and pH adjustments were used at each plant; plus coagulation at the Jensen plant and ion exchange softeners at the Weymouth plant. Reverse osmosis to reduce salinity was investigated. Membrane cleaning and feed water acidification and treatment with Calgon were used. Feed water pretreatment with a primary coagulant followed by filtration was effective in removing colloidal silicate minerals and organic matter. Plant operating processes were studied to develop improved treatment methods. Cationic polymers in multi-column filters gave better filtered water. A subsurface wash reduced mudball volumes. Fluid sludge was best dewatered with pressure filters. Water quality, corrosion, algal growth, taste, and odor problems were studied. Operation, maintenance, repair, modification, sludge disposal, and use of chemicals, power, and cation exchange are described. Table of agricultural water deliveries; chemical and bacteriological analyses; variations in hardness and total dissolved solids; and cation exchange softener operations and graphs of average rates of flow and chemical quality of water to treatment plants are included. (See also W76-03285) (Buchanan-Davidson--Wisconsin).
W76-03288

ENGINEERING.
In: The Metroplitan Water District of Southern California report for the fiscal year July 1, 1973 to June 30, 1974, p 63-77, 1 fig.

Descriptors: *Met. Water Dist. of So. Cal., *Engineering, *Distribution systems, *California, Water purification, Water storage, Tunnels, Pipelines, Reservoirs, Water distribution(Applied), Water delivery, Filtration, Projects, Water rates, Financing, Hydroelectric power, Design, Facilities, Economics, Water demand, Water treatment, Construction costs.
Identifiers: Feeder systems, Filtration plants.

The engineering activities of the Metropolitan Water District of Southern California include planning, design, and construction of water transportation facilities, purification, and storage facilities. A billion dollar expansion program includes the construction of 300 miles of tunnels and pipelines, two reservoirs, flow and pressure control facilities, water filtration plants, a headquarters building annex, and improvements to existing facilities. Current projects include planning and construction of the Foothill, Sepulveda, Inland, and Yorba Linda Feeder Systems; and the Joseph Jensen, Robert A. Skinner, and Riverside Filtration Plants. Environmental impact studies, inundation maps, feasibility studies to determine the hydroelectric power potential, surveillance of dams and reservoirs, test programs, engineering designs for ten new service connections, and worker's compensation insurance are discussed. Advanced planning was done to provide extended

lead time for construction of facilities required to furnish water needed to satisfy probable future demands and to solve financial and economic problems caused by changing conditions of demand for water and changing costs of operation, construction, and related activities. Water demands are analyzed and plans were made to improve water quality. Studies of water pricing, surcharge rates for water treatment, and construction cost monitoring were made. (See also W76-03285) (Buchanan-Davidson--Wisconsin)
W76-03289

STATE WATER PROJECT.
In: The Metropolitan Water District of Southern California report for the fiscal year July 1, 1973 to June 30, 1974, p 78-85, 1 tab.

Descriptors: *Met. Water Dist. of So. Cal., *Projects, *Water supply, *California, Financing, Contracts, Capital costs, Construction, Facilities, Pumping plants, Electric powerplants, Recreation facilities, Interest rates, Electric power demand, Pumping, Electric power costs, Electric power production.
Identifiers: *State Water Project(Calif).

The Metropolitan Water District of Southern California activities related to obtaining water from the State Water Project included administration of the water service contract, monitoring project construction and operations, and representing the district at meetings and legislative and administrative hearings. At the end of the fiscal year 76% ($2,306 billion) of the total estimated expenditures for capital costs of the 1985 State Water Project facilities excluding additional conservation facilities and the San Joaquin Master Drain had been spent. Construction on the project was reduced because the first phase had been completed. The District received 191,723 acre-feet of State Project water. Power for State Water Project pumping facilities comes from project power recovery plants, the Pacific Northwest, and California utilities. Alternate power sources are being sought because of anticipated higher rates after 1983. State project facilities were used for recreation by over 2.5 million visitor days. Water contact sports and fishing were predominant uses. The Antelope Valley bikeway was opened. Litigation on Amendment No. 12 of the Metropolitan's water service contract, contract negotiations, settled issues, payment procedures for State Water Project service, and existing and proposed water exchange contracts are discussed. Payments to the state are summarized. (See also W76-03285) (Buchanan-Davidson--Wisconsin).
W76-03290

CONSTRUCTION.
In: The Metropolitan Water District of Southern California report for the fiscal year July 1, 1973 to June 30, 1974, p 87-99, 2 tab.

Descriptors: *Water distribution(Applied), *Met. Water Dist. of So. Cal., *Construction, *Projects, *Costs, *Contracts, *California, Tunnels, Pipelines, Reservoir storage, Treatment facilities.

Construction costs, including construction materials, equipment, right-of-way, engineering, and administration, totaled $56,097,200 for the fiscal year. Included in this total is $906,100 for the cost of constructing service connections to provide service to member agencies and for modifications that were requested to existing District facilities for the convenience of others. The District will be reimbursed for these costs by the agencies requesting the work. Eleven construction contracts having a total value of $29,229,149 were awarded by the District's Board of Directors and 11 contracts with gross earnings totaling $39,367,930 were completed. At the end of the fiscal year, work was in progress under 17 construction contracts having a total value of $86,788,310. The feature of each contract, the contractor, contract starting date, contract cost, and status on June 30, 1974 are tabulated. (See also W76-03285) (Auen-Wisconsin).
W76-03291

HYDROGRAPHY.
In: The Metropolitan Water District of Southern California report for the fiscal year July 1, 1973 to June 30, 1974, p 101-115, 4 fig, 2 tab.

Descriptors: *Met. Water Dist. of So. Cal., *Hydrography, *Planning, *Institutions, *Water resources development, Engineering, California, Water quality control, Water storage, Water sources, Water rights, Colorado River Basin, Waste water treatment, Ecology, Environmental effects, Salinity, Reservoir storage, Rainfall, Regional development, Groundwater, Reservoirs, Projects, Cost repayment, Water supply, Water utilization, Water transfer.

Primary concerns of the hydrographic engineering division of the Metropolitan Water District of Southern California are quality and quantity of water available from the Colorado River, the State Water Project, and other possible sources. Activities discussed were those related to water rights for surface and underground water supplies; basin plans for water quality management, standards, and controls; regional resource planning; wastewater treatment and reuse plans; and ecological and environmental studies. Federal, state, and local reports related to water and land resource planning are reviewed. Activities of the California State Water Resources Control Board and the Regional Water Quality Control Boards which related to basin plans for water quality management were especially important. The Lake Skinner operating plan; Morris Reservoir studies; Central Arizona project; the proposed Lake Mead accumulative storage program; and the Colorado River Basin salinity control program, reservoir storage, water supply, utilization, and quality are described. An environmental impact report of the proposed construction of the Peripheral Canal as part of the State Water Project is discussed. Graphs show amounts of usable water storage in reservoirs, water quality, and the Los Angeles rainfall record. Data is given on the quality of Colorado River water at the Whitsett Intake Pumping Plant. (See also W76-03285) (Buchanan-Davidson--Wisconsin).
W76-03292

LEGAL.
In: The Metropolitan Water District of Southern California report for the fiscal year July 1, 1973 to June 30, 1974, p 117-139.

Descriptors: *Met. Water Dist of So. Cal., *Legal aspects, *California, Colorado River Basin, Legislation, Right-of-way, Nevada, Taxes, Financing, Environment, Federal government, Nuclear powerplants, Indian reservations, Income, Bond issues, State Governments, Planning, Contracts, Judicial decisions, Conjunctive use, Mexican Water Treaty, Cooling water.
Identifiers: Annexation, Condemnation.

The General Counsel provided the Board of Directors and officers of the Metropolitan Water District of Southern California with legal representation, advice, and opinions on legal matters. Annexations, taxation, revenue bonds, application and interpretation of environmental quality acts, groundwater management, land matters, and right of ways are discussed. All legislation introduced in the California legislature was examined by counsel to see what was of interest and concern to the district; recommendations were made concerning legislation which required policy determination. State measures which were enacted to become effective in 1975 are discussed. Federal legislation pertinent to the district is also examined. The progress, status, and results of various cases which were in litigation in California, Nevada, and the federal courts are presented. Agreements volved in the supply of Colorado River water proposed nuclear power plants are described. claim of the Mohave Indians filed in 1951 agai the Indian Claims Commission for loss of Moh Reservation lands caused by construction, ope tion, and maintenance of Parker Dam is still pe ing. (See also W76-03285) (Buchanan-Davidso Wisconsin).
W76-03293

PURCHASING, PERSONNEL, AND RIGHT WAY.
In: The Metropolitan Water District of South California report for the fiscal year July 1, 197 June 30, 1974, p 141-145.

Descriptors: *Met. Water Dist. of So. *Operation and maintenance, *Costs, Person *California, Right-of-way, Employee relati Water treatment, Equipment, Land, Leases, R Taxes, Water districts.
Identifiers: Land acquisition, Surplus disposal, Annexation.

In addition to the purchase of large items u formal contracts, the Metropolitan Water Dis of Southern California spent $6,602,056 for year on purchase orders for materials, equipm and services necessary for operation, m tenance, and new construction. There wre employees, of which 90 were temporary. Se seminars were held for management emplo supervisors, and foreman. Negotiations acquisition of rights of way necessary for the structions of new facilities or expansion and tection of existing facilities were continued. perty acquisitions were made for feeder pipel a tunnel, a desalting project and a utility cor and electrical switchyard site required fo desalting project. Disposal of surplus prop and requests for easements, consents, per and licenses were also processed. Secor usage of the District's right-of-way for recre and environmental enhancement was consid Finances involved in the leasing of property perty taxes, and assessments on property handled. Several annexation changes were m report on boundary changes prepared, and mation on taxable property submitted to c auditors. (See also W76-03285) (Buchanan-D son--Wisconsin).
W76-03294

FINANCING.
In: The Metropolitan Water District of So California report for the fiscal year July 1, June 30, 1974, p 147-171, 14 tab.

Descriptors: *Met. Water Dist. of So. *Financing, *California, Income, Water Operating costs, Operation and mainte Repairing, Principal, Interest, Bond issues, Contracts, Water districts, Net income, ment, Equity, Capital, Debt, Assessments.
Identifiers: Annexation.

The Metropolitan Water District of So California Board of Directors fixes water r produce revenue to pay operating expense vide repairs and maintenance, purchase or for property, services, and other rights; a interest and principal of bonded debts. D wide ad valorem taxes can be levied for bo vice and payment of obligations from water contracts with California. Ad valorem prope levies are also authorized for general pu The board can determine conditions for a tion and issue bonds. For the fiscal yea sales revenues were $65,009,000 for 1, acre-feet of water delivered. Investment was $12,050,000, time deposits and secu vestments $146,814,000, and operating e $50,398,000. There was a net loss of $2,4 tax levies are not considered income but tributions to equity. Capital investme

5,722,665, tax levies $56,087,556, total assessed operty valuation $32,839,617,218; and district operty taxes $45,963,910. Annexation fees may paid in cash at time of annexation or amortized er a 30-year period. There was a net increase in uity of $46 million. The fund balance was 47,621,785 on June 30, 1974. The total net direct d overlapping bonded debt was 11.50% of the 73-74 assessed valuation of $32,836,859,113. ee also W76-03285) (Buchanan-Davidson--isconsin).
76-03295

EVELOPMENTS IN PUMPING SYSTEM, A VO YEARLY REVIEW, PUMPING AND THE IPINGHAM SCHEME.
r primary bibliographic entry see Field 8C.
76-03340

ND-USE CHANGE AND THE WATER LANCE--AN EXAMPLE OF AN APOTRANSPIRATION SIMULATION ODEL,
go Univ., Dunedin (New Zealand). Dept. of ography.
primary bibliographic entry see Field 2D.
6-03359

ESTIMATE OF TOTAL SURFACE AREA OF GETATION FOR PUKEITI CATCHMENT, RTHLAND, NEW ZEALAND,
istry of Works and Development, Nelson w Zealand).
primary bibliographic entry see Field 4D.
6-03360

NAMIC SIMULATION OF WATER RAGE IN FALLOW SOIL AS AFFECTED MULCH OF HYDROPHOBIC AG-EGATES,
as A and M. Univ., College Station. Dept. of and Crop Sciences; and Texas Agricultural eriment Station, College Station.
primary bibliographic entry see Field 2G.
6-03365

LATIONSHIPS BETWEEN THE HYDRAU- CONDUCTANCE OF SURFACE CRUSTS SOIL MANAGEMENT IN A TYPIC LUDALF,
Survey Inst., Wageningen (Netherlands).
primary bibliographic entry see Field 2G.
-03366

EE SYSTEM RELIABILITY ALONG A IFLUENCE REACH,
vs Lorand Univ., Budapest (Hungary). Dept. umerical Methods.
primary bibliographic entry see Field 8B.
-03383

OMETRIC CHANGE OF LANDFORMS,
ona Univ., Tucson. Dept. of Geosciences.
. Bull.
ogical Society of America Bulletin, Vol 86, 1, p 1489-1498, November 1975. 9 fig, 3 tab, f.

riptors: *Land forming, *Geomorphology, es, *Drainage, *Channel morphology, Sedi- yield, Streams, Discharge(Water), Hydrau- Pleistocene epoch, Model studies, Rivers, s(Water), Ponds.
ifiers: *Allometric change, Steady state, Flu- rocesses.

metric analysis has been used with considera- ccess to describe adjustment of streams and odel appeared to have promise for describing terrelations between materials, processes, landforms for a broad spectrum of geomorphic settings. Allometric adjustment can be shown to exist by demonstrating consistent and statistically significant interrelations between two or more geomorphic features of an open system. Allometric analysis can be used to describe the dynamic interrelations of aspects of a landform or process at different times during its history. The model applied to those landforms and processes that do, and those that do not, tend toward steady state. (Bhowmik-ISWS)
W76-03384

HURRICANE AGNES RAINFALL AND FLOODS, JUNE-JULY 1972,
Geological Survey, Reston, Va; and National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2E.
W76-03397

HYDROLOGY OF THE SOUTH PLATTE RIVER VALLEY, NORTHEASTERN COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-03398

WATER RESOURCES OF WEST-CENTRAL MISSOURI,
Geological Survey, Rollo, Mo.
For primary bibliographic entry see Field 7C.
W76-03401

THE CHANNELS AND WATERS OF THE UPPER SALMON RIVER AREA, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 2E.
W76-03405

TECHNIQUES FOR WATER DEMAND ANALYSIS AND FORECASTING: PUERTO RICO, A CASE STUDY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6D.
W76-03407

GUIDELINES FOR FLASH FLOOD AND SMALL TRIBUTARY FLOOD PREDICTION,
National Weather Service Forecast Office, Washington, D.C.
L. A. Huges, and L. L. Longsdorf.
Available from the National Technical Information Service, U.S. Dept. of Commerce, Sills Building 5285 Port Royal Road, Springfield, VA 22161. NOAA Technical Memorandum NWS CR-58, October 1975, 13 p.

Descriptors: Floods, *Flood forecasting, *Flood control, *Flash floods, *Forecasting, Flood profiles, Rainfall, Rain, River basins, Storms, Streamflow, Weather forecasting, Thunderstorms.
Identifiers: *Tributary floods, Flood potentials, *Heavy rainfall, Flood indices, *Flood predictions, Basin flooding, Rainfall measurement, Radar estimates, Flood potential.

This technical note, augmenting Manual Chapter E-13, was devised to provide all offices with guidelines for determining the threat and extent of flash floods and other small tributary floods. Basically these involve knowledge of when, how much and how fast rain came down and over how much of a particular river basin, and some method for coverting this to river stage or flood potential. This report discusses these two points. Offices with a radar or a WBRR recorder play a key role in such efforst as they have knowledge of the extent and location of heavy rain that other offices, at times, do not have. This paper starts with anticipating and locating heavy rain areas. Then extent of the flood will be estimated, with increased precision and objectivity, depending on how much specific information is available for the purpose, be it nothing but experience or the maximum consisting of flood indices and advisory tables. (NOAA)
W76-03417

REPORT ON ENVIRONMENTAL STUDY INTO THOMSON DAM AND ASSOCIATED WORKS.
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 6G.
W76-03448

CHANGE IN YIELD OF WATER FOLLOWING A BUSHFIRE IN A FOREST OF EUCALYPTUS REGNANS,
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 4C.
W76-03449

FLOOD PLAIN INFORMATION: PETERS CREEK, BIRCHWOOD, ALASKA.
Army Engineer District, Anchorage, Alaska.
Prepared for the Greater Anchorage Area Borough, Anchorage, Alaska, May, 1974. 27 p, 12 fig, 14 plates, 2 tab.

Descriptors: *Floods, *Flood forecasting, *Flood profiles, *Flood plains, *Flood data, Flood flow, Erosion, Peak discharge, Stream erosion, Glaciation, Warning systems, Flood peak, Obstruction, *Alaska.
Identifiers: Birchwood(Alaska), Anchorage(Alaska), Peters Creek(Alaska), Knik Arm Creek(Alaska), Standard Project Flood, Intermediate Regional Flood.

Though there is little historical flood data available for this 5.5 mile portion of Peters Creek, statistical analyses of streams in the region establish that Intermediate Regional Flood will occur reaching a height of 74.6 ft with peak flow of 4100 cubic feet/second, velocities of main channel flow of 7 to 14 ft/sec and overbank flows averaging 2 to 4 ft/sec. A Standard Project Flood will have a peak discharge of 8600 cfs and reach a height of 81.1 ft. In August, 1971, heavy rains caused flooding which reached a height of 71.6 ft at the gage located .8 mile from its confluence with Knik Arm. Since the area has minor residential development, damage was limited, displacing some 35 families, washing out roads and utilities. Future flooding can be expected to cause more damage since the area is absorbing residential overflow from Anchorage. This reach of Peters Creek, with a drainage area of 262.1 sq miles and a slope of 180 ft/mile, is crossed by 5 bridges and has heavy bank vegetation capable of obstructing flood flow. There are no flood control measures in effect but a flood warning system does exist. Flooding can occur in spring, summer or fall, resulting from snowmelt, glaciation, and storm fronts. (Henley-North Carolina)
W76-03454

FLOOD PLAIN INFORMATION: SOUTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento , Calif.
Prepared for San Joaquin County, California, June, 1974. 53 p, 22 fig, 29 plates, 10 tab.

Descriptors: *Floods, *Flooding, *Flood data, *Flood recurrence interval, *Maximum probable flood, Historic floods, Flood damage, Flood profile, Flood forecasting, Flood frequency, *California.
Identifiers: Stockton(Calif), San Joaquin County(Calif), Littlejohns Creek(Calif), Duck Creek(Calif), Lone Tree Creek(Calif), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

The second of four reports intended to cover the entire greater Stockton area, this study discusses the southeast sector from State Highway easterly to the foothill line, and from the Calaveras River drainage on the north to the Stanislaus River

drainage on the south. Development in the area is approximately 94% agricultural and trends indicate minimal deviation. Population projections estimate an increase in population of 3,500 to 10,000 by the year 2000. Of the three creeks under study, Duck, Littlejohn, and Lone Tree, Littlejohns is the major creek. Two facilities provide flood protection: the Farmington Dam project, completed in 1951, which consists of Farmington Dam and Reservoir and the Duck Creek Diversion to Littlejohns Creek, and the improvement of Duck Creek channel completed in 1967. These two facilities provide protection against floods expected to occur once in 25-35 years or once in 10-15 years if there are flows through the Duck Creek Diversion. The largest flood occurred in 1958 with a peak discharge of 3,590 cfs, which inundated 2,000 agricultural acres. Future floods could be even larger than the 60-year frequency 1958 flood. The Intermediate Regional Flood (IRF) and the Standard Project Flood (SPF) would have peak discharges of 4,900 cfs and 5,100 cfs respectively at the Escalon-Bellota Road over Littlejohns Creek. Velocities could produce substantial erosion. (Park-North Carolina)
W76-03455

FLOOD PLAIN INFORMATION: WILDCAT CREEK, MANHATTAN, KANSAS.
Army Engineer District, Kansas City, Kans.
Prepared for the City of Manhattan, Kansas, through the Kansas Water Resources Board, December, 1971. 32 p, 12 fig, 9 plates, 3 tab.

Descriptors: *Flood control, *Flood protection, *Floods, *Flooding, *Flood profiles, Flood plains, Historic floods, Flood damage, *Kansas.
Identifiers: Wildcat Creek(Kansas), Manhattan(Kansas).

Originating 28 mi north of Manhattan, Wildcat Creek flows southeasterly along the city's western edge, entering the Kansas River south of the city. Its basin has a jagged oblong shape and a watershed of 88 sq mi. Channel width in the study reach averages 80 ft with a bottom slope of 12.5 ft/mi. Flood plain width is about 1,200 ft. In the upper basin runoff is from agricultural lands; in the lower basin runoff is influenced by development on the fringes of the city. Approximately 1.3 sq mi of the lower left bank area is within the Manhattan Protective Works with runoff discharged through a pumping plant. Extensive commercial, industrial and residential development is increasing on the flood plain which has most of the remaining vacant land. Projected population increase for Manhattan Urban Area is 14,000 by 1985. Floods created by heavy rainfall have high peaks, high velocities, short durations and relatively small volumes of runoff. No flood damage prevention program exists. The largest known flood in June 1965 had a peak discharge of 6,300 cfs. Since there are no gage records, precipitation and streamflow records of nearby basins were used to compute discharges for the Intermediate Regional Flood (IRF) and Standard Project Flood (SPF). An IRF would have a peak discharge of 13,800 cfs at Manhattan with average channel velocities of 10.2 ft/sec and 1.8 ft/sec overbank at the Union Pacific Railroad. Peak discharge for SPF would be 24,500 cfs with channel velocities of 10.9 ft/sec and 2.9 ft/sec overbank at the same location. At other points channel velocities for SPF can rise as much as 13.2 ft/sec with overbank velocity 5.4 ft/sec. peaking in about 14 hours and remaining out of banks for as much as 32 hours. (Salzman-North Carolina)
W76-03456

FLOOD PLAIN INFORMATION: ROARING BROOK, AVON, CONNECTICUT.
Army Engineer District, Waltham, Mass.
Town of Avon, Technical report. October 1966. 22 p, 13 fig, 2 tab, 10 plates

Descriptors: *Floods, *Flooding, *Flood plains, *Flood profiles, Channel improvement, Flood damages, Non-structural alternatives, Flood plain zoning, Building codes, Flood peak, Storms, Hurricanes, Dams, Flood protection, Snowmelt, *Connecticut.
Identifiers: Roaring Brook(Cn), Avon(Cn), Secret Lake(Cn), Hartford County(Cn), Jim Brooks(Cn), Farmington River(Cn), Farmington(Cn), Canton(Cn), Manning's Friction Formula.

The study area extends from Secret Lake at the Avon - Canton town line along Roaring Brook to the Avon - Farmington town line, a distance of 4.4 miles. Located 3 miles west of the Avon business district, Roaring Brook, a tributary of Farmington River, drains an area of 9.8 square miles in Hartford County. The flat, wide flood plains are without industrial or commercial development and only a few homes have experienced flooding in the past. Residential development in the basin is occurring but to date has not been located in probable flood areas. Extended development on both sides of the stream is anticipated. Currently, Avon utilizes subdivision regulations to control development in the flood plain. Bridges and 3 dams can obstruct floodflows. Flood flows are effectively reduced by Secret Lake and a large swamp area immediately upstream from the study area. Average rainfall in adjacent Hartford is about 42.8 inches, annual average snowfall about 41.5 inches. Flooding can occur as the result of cyclonic continental storms, hurricanes, and thunderstorms and can be augmented by snowmelt. The flood of August, 1955, the most severe in recent history, had a peak discharge of 1,150 cubic feet per second and damaged homes along the eastern shore of Secret Lake. This flood had the characteristics of a 1-2% annual probability flood. Consideration of the following factors is recommended in the development of a general plan for guiding development: (1) effect of filling (2) flood losses (3) cost of protective measures (4) cost of floodproofing and (5) cost of insurance. (Henley-North Carolina)
W76-03457

FLOOD PLAIN INFORMATION: ESCONDIDO CREEK, SAN DIEGO COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
Prepared for San Diego County, May, 1972. 34 p, 14 fig, 18 plates, 5 tab.

Descriptors: *Floods, *Floodwater, *Flooding, *Flood forecasting, *Flood profiles, *Stream erosion, *Flood plains, *Flood plain zoning, Streamflow forecasting, *California, Thunderstorms, Flood frequency, Peak discharge, Flood peak, Flow characteristics, Erosion, Obstructions to flow, Non-structural alternatives, Dikes.
Identifiers: Escondido Creek(Calif), La Orilla Road Tributary(Calif), Escondido(Calif), Lake Val Sereno(Calif), San Elijo Lagoon(Calif), Intermediate Regional Flood, Standard Project Flood, Debris-laden floods.

Land use along Escondido Creek from the Pacific Ocean to the City of Escondido has been primarily agricultural in the past and, except for the area around Lake Val Sereno at the upper study limit where some increase is expected in residential development, little change is anticipated. Portions of the flood plain of Escondido Creek and La Orilla Road Tributary (total drainage area 78 sq mi) are studied. General winter storms, local thunderstorms, and tropical hurricanes produce precipitation. High intensity rainfall, in combination with steep streambed gradients and effects of preceding fires, result in intense debris-laden floods. Though 6 large floods have occurred, since 1916 there are no streamflow records for Escondido Creek. Data from similar basins was used for flood projections. A flood in 1966 caused minor damage. In an Intermediate Regional Flood (IRF) peak flows of 22,000 cfs at the mouth of Escondido Creek are expected, accompanied by channel velocities of 5 to 10 ft/sec at various locations. A Standard Project Flood would produce a pea flow of 32,000 cfs at the mouth of the creek wi channel velocities of up to 11 ft/sec. In the ste canyon section velocities would reach 24 ft/s causing severe erosion. Damage due to floodi could include mobile homes, a sewage treatme plant and pumping station, residences, agricultur lands, and a golf course. Approximately one-ha mile of earth dike channelizes Escondido Creek the upstream end of the study area, but no oth flood control projects exist. San Diego County now rezoning those portions of the flood pla which would be affected by an IRF. (Smith-Nor Carolina)
W76-03458

FLOOD PLAIN INFORMATION: RILLI RIVER AND PANTANO WASH, VICINITY TUCSON, ARIZONA.
Army Engineer District, Los Angeles, Calif.
Prepared for Pima County, June, 1973. 30 p, 23 f 20 plates, 6 tab. Preliminary designated floodw Jan., 1974. 1 p, 7 plates.

Descriptors: *Flash flood, *Flood forecasti *Flood profiles, *Peak discharge, *Erosi *Bank erosion, *Flood plains, *Floodwa Floods, Flooding, Historic floods, Flow char teristics, Non-structural alternatives, Channel provement, *Arizona.
Identifiers: *Rillito River(Ariz), *Pant Wash(Ariz), *Designated floodway, Tucson(Ar Tanque Verde Creek(Ariz), Floodway frin Overbank limits.

Rillito River (drainage area 934 sq mi) is formed the confluence of Pantano Wash and Tan Verde Creek northwest of Tucson which ha population of more than 250,000 in metropolitan area with continued urban expan anticipated. Pantano Wash (drainage area 60 mi) rises in Santa Rita Mountains and flows n through alluvial plains to its confluence Tanque Verde Creek. Mostly agricultural and developed desert land, drainage area ranges f 9450 ft mean sea level in headwater regions to ft msl at downstream limit. Debris laden f floods rise in the mountains, spread out over ley plains with reduced velocities, deposi debris and losing flow to streambed percola Pima County requires that new development protected against major stream flooding. M floods (peak discharge over 12,000 cubic feet second) have occurred at irregular intervals 1880 with September, 1929 having lar discharge of 24,000 cfs. The December, 1965 f (discharge 12,400 cfs) caused extensive dama Tucson eroding banks and destroying ho roads and sewer line. During an Intermediate gional Flood (IRF), Rillito River would ha peak flow of 31,000 cfs, channel velocities w range from 9-12 ft/sec with 2 ft/sec overbank pected peak flow for a Standard Project F (SPF) would be 81,000 cfs, channel velocity ft/sec, 3 ft/sec overbank. Pantano Wash w have a peak flow of 32,000 cfs, channel veloc from 10-14 ft/sec with 0-2 ft/sec overbank f IRF; 61,000 cfs peak flow, channel velocities ft/sec with 3-10 ft/sec overbank for an SP preliminary designated floodway for Rillito is appended. (Hufschmidt-North Carolina)
W76-03459

FLOOD PLAIN INFORMATION: BIG CR LOST CREEK, CHRISTIAN CREEK WHITEMAN'S CREEK, JONESBORO, AR SAS.
Army Engineer District, Memphis, Tenn.
Prepared for the City of Jonesboro, March, 41 p, 10 fig, 18 plates, 16 tab.

Descriptors: *Flood profiles, *Floods, *Floo *Flood flow, *Flood forecasting, Maxi probable flood, Flood plains, Runoff, discharge, Flood peak, Flow duration, characteristics, Flood data, Flood frequ Overflow, *Arkansas.

ntifiers: Jonesboro(Ark), Bid Creek(Ark), Lost eek(Ark), Christian Creek(Ark), Whiteman's eek(Ark), Standard Project Flood, Intermediate gional Flood.

esboro, located on the watershed divide ween the St. Francis and Cache Rivers, has exienced flooding along the four creeks of this dy area. In January, 1969, 4.73 inches of rain during a 24-hour period causing extensive oding, especially along Whiteman's Creek and t Creek. High water marks during this flood e usually below the top of the banks, indicating there is poor local drainage. Analysis indicates the Intermediate Regional Flood (IRF) for Big ek and Lost Creek would be about 2.5 feet rbank and 1.5 feet overbank on Christian ek and Whiteman's Creek. 'Standard Project od (SPF) determinations indicate that floods ld be about 1.7 feet higher than the IRF on Big ek, Lost Creek, Christian Creek and teman's Creek.' Water velocities during the would range up to 8.2 ft/sec in the channel of Creek; to 5.2 ft/sec on Whiteman's Creek. ocities on the flood plains would average less 1.5 ft/sec. During the SPF, velocities would e from 11.8 ft/sec on Big Creek to 7.4 ft/sec on Creek. Velocities on the flood plains during PF would range from 3.0 ft/sec on Whiteman's k to 1.8 ft/sec on Big Creek. These four ks drain approximately 142 sq mi. The main d season is winter and spring. Duration of ding can be expected to be short and the rate se rapid. (Henley-North Carolina)
-03460

CIAL FLOOD HAZARD INFORMATION ORT: BEAR CREEK, DENVER ROPOLITAN AREA.
y Engineer District, Omaha, Nebr.
ared for Colorado Water Conservation Board, mber, 1972. 17 p, 4 fig, 10 plates, 3 tab.

riptors: *Floods, *Flood forecasting, *Flood les, *Flood damage, *Flood plains, orado, Floodwater, Flooding, Flash flood, d flow, Snowmelt, Historic floods, Flood Flood frequency, Peak discharge, Flow cteristics, Erosion, Bank erosion, Obstruct to flow, Flood protection, Warning systems, on control, Channel improvement, Riprap.
ifiers: Bear Creek(Colo), Turkey k(Colo), Morrison(Colo), Sheridan(Colo), River(Colo), Denver(Colo), Intermediate nal Flood, Standard Project Flood.

use in this study area, which extends 7.5 from the mouth of Bear Creek to about 1.8 stream from South Kipling Street, is about commercial, 24% residential, 9% transporta-1% public property and the balance in various In 1970, 6050 people lived in the Bear Creek plain and greater development is expected. Creek drains 261 square miles, the basin 36 miles long and 13 miles wide at its max-. Turkey Creek, draining 52 sq mi, joins Bear 2 mi downstream from Morrison. Bear flows into the South Platte River in the rn Denver Metropolitan Area and has a ity of 2500 cubic feet per second without g flooding. Flood records since 1927 at lan and periodically since 1888 at Morrison te that high peak discharges occurred in 1933 969. The 1933 event was gaged at 8110 cfs at on and 3000 cfs at Sheridan, whereas the lood was measured at 8150 cfs at Sheridan 340 cfs at Morrison indicating that past ed floods have occurred either above or Morrison but never in both drainage areas at ne time. For an Intermediate Regional Flood discharge of 30,000 cfs is predicted with velocities of 7 feet per second. A large flood last 12 hours, though steady rains combined owmelt runoff could result in high flows for s or more causing severe erosion. A Stanroject Flood would have a peak discharge of cfs and inundate a large shopping center, many homes and several large mobile home parks. River stage forecasts for Bear Creek are made by the Weather Service to warn of flash flooding with flood crests anticipated about 6 hours after lead time. (Smith-North Carolina)
W76-03461

FLOOD PLAIN INFORMATION: CACHE LA POUDRE RIVER, COLORADO, VOLUME II, GREELEY, WELD COUNTY.
Corps of Engineers, Omaha, Nebr.
Prepared for Larimer-Weld Planning Commission, March 1974. 30 p, 12 plates, 19 fig, 5 tab.

Descriptors: *Flood plains, *Flood data, *Flood profiles, *Flood forecasting, *Flow characteristics, Snowmelt, Runoff, Flood plain zoning, Reservoirs, Storms, Historic floods, Peak discharge, Flow duration, Flood damage, *Colorado.
Identifiers: Cache La Poudre River(Co), South Platte River(Co), Greeley(Co), Weld County(Co), Larimer County(Co), Standard Project Flood, Intermediate Regional Flood.

This 14.8 mile study reach of the Cache La Poudre River, a tributary of South Platte River, extends from the mouth near Greeley to about a mile above Sheep Draw and drains an area of 1,890 square miles. The river has a slope of 6.6 ft./mile in this reach, with flood plain widths ranging from 3,500 to 4,000 ft. largely without urban development, although a large number of buildings are located in the flood plain on the northeast side of Greeley. In Greeley the flood plain is moderately developed. Fourteen bridges, roadways and vegetation can obstruct flood flows. Continued growth in Greeley (1970 population 38,902, projected 1990 population 75,000) is expected to exert further development pressure on the flood plain. Greeley presently has zoning ordinances which restrict development within an area less than 200 ft. from the centerline of the river. Flooding can occur from May to September as the result of intense rainfall. Snowmelt can augment floodflows in May, June and July. Typically, floods will peak within 4 days of an intense rainfall and will last several days. Flooding in June 1965 with a peak discharge of 3,480 cubic feet per second did $700,000 damage to rural areas in the Poudre basin and $85,000 damage in the vicinity of Greeley. Standard Project Flood and the Intermediate Regional Flood will have peak discharge of 29,000 and 9,000 cfs respectively at the 25th Ave. bridge. (Henley-North Carolina)
W76-03462

4B. Groundwater Management

ECONOMIC EFFECTS OF LAND SUBSIDENCE DUE TO EXCESSIVE GROUNDWATER WITHDRAWAL IN THE TEXAS GULF COAST AREA,
Texas A and M Univ., College Station. Water Resources Inst.
L. L. Jones, and J. Larson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 454, $4.00 in paper copy, $2.25 in microfiche. Technical Report No 67, September 1975, 33 p, 2 fig, 8 tab, 7 ref. OWRT A-032/TEX (1). 14-31-0001-5044. 14-34-0001-6045.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, Evaluation, Costs, *Texas, *Economic impact, Water demand, Cost comparison, Estimating.
Identifiers: Houston(Tex), Baytown(Tex), Pasadena(Tex), LaPorte(Tex), Seabrook(Tex), Clear Lake(Tex), Kemah(Tex), Texas Gulf Coast area, *Galveston Bay area.

The Texas Gulf Coast area is experiencing subsidence of the land surface due to excessive withdrawals of groundwater. Damages and property losses are significant, especially along the upper Galveston bay are, including Houston, Baytown, Clear Lake City and other developments. This study estimates total annual damages and losses for a 945 square mile study area to be $31.7 million. Temporary flooding, permanent inundation, bulkheading and landfilling were the major subsidence-related causes of cost and/or losses in property value. Structural damages from subsidence aggrevated faults were also significant. Damages and losses were more intensive in areas adjacent to Galveston Bay and major waterways. Breakeven analysis implies economic justification for withdrawing only that quantity of water that would result in no subsidence. Water needs above that rate should be imported to minimize total costs to the area. Importation of up to 198 billion gallons per year would be justified to meed demand and avoid subsidence. At current water use rates and prices of surface and groundwater, the area could save as much as $11.4 million annually, even if all water needs were met from surface sources.
W76-03099

AQUIFER EVALUATION USING DEPOSITIONAL SYSTEMS: AN EXAMPLES IN NORTH-CENTRAL TEXAS,
Dames and Moore, Boca Raton, Fla.
For primary bibliographic entry see Field 2F.
W76-03111

SOUTH PLATTE RIVER FLOW CORRELATIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. E. Glover.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No. IR3, Proceedings Paper 11563, p 175-186, September 1975. 3 fig, 3 tab, 15 ref, 2 append.

Descriptors: *Water management(Applied), *Water resources development, *Conjunctive use, *Optimum development plans, *Surface-groundwater relationships, Withdrawal, Diversion, Pumping, Prior appropriation, Water allocation(Policy), Water supply, Flow characteristics, Groundwater, Hydrology, Irrigation, Return flow, Streamflow, *Colorado.
Identifiers: *South Platte River(Colo).

Administration of water resource management legislation on the South Platte River has been hindered by the lack of knowledge of surface water-groundwater relationships. Effective management of appropriation by surface diversion and groundwater pumping requires some advance knowledge of quantitative effects of polity decisions. A computation method for evaluating these effects was developed and applied to the South Platte; comparison of computed results to past performance of the River supported the method. Major computations were reduced to tabular form for ease of application. The effect of pumping in the valley was determined by the method to be depletion of the river flow by approximately one-fifth the yield of the watershed. Since the response of river flow to variation in pumping is demonstrably slow, it is futile to include wells in the priority allocations scheme; yet the surface and groundwaters of the South Platte valley must be considered a single water supply, because no acceptable river flow correlations can be obtained while return flows of groundwater to the river are excluded. (Bender-ISWS)
W76-03117

DETERMINING OPTIMAL WELL DISCHARGE,
Colorado State Univ., Fort Collins.
O. J. Helweg.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 101, No IR3, Proceedings Paper 11566, p 201-208, September 1975. 5 fig, 6 ref, 3 append.

Descriptors: *Cost-benefit ration, *Discharge(Water), *Water wells, Drainage, Costs, Economics, Geohydrologic units, Groundwater, Water table, Irrigation, Optimization, Pumping, Water resources, Water supply, Wells, Well spacing, Water yield.
Identifiers: *Well yield, *Well loss, *Optimum use.

The cost of pumping groundwater is a major factor in water supply. It is necessary to pump a given well at the discharge that maximizes the net benefit of the operation. Previous criteria ignored the economic aspects of the analysis; a detailed criterion for obtaining the best discharge for a well was submitted. A real world example showed the importance of considering well losses in any analysis. A computer code is included along with an example of the analysis. (Visocky-ISMS)
W76-03118

ENERGY DISSIPATOR AIDS FIGHT AGAINST HIGH PRESSURE PROBLEMS.
Water and Sewage Works, Vol 5, No 2, p 76-77, September, 1975. 2 fig.

Descriptors: *Energy dissipation, *Water pressure, *Cavitation, *Equipment, Water rates, Water supply, Costs, Aqueducts, Wells, Environmental effects, *California.
Identifiers: *Energy dissipator.

Because of environmental considerations it became necessary for wells in California's San Bernardino mountain region to be closed and for water to be drawn for this region from the Feather River aqueduct that traverses the coastal mountain chain. Because of pressures as high as 172 ft/sec, severe cavitation problems were involved in transporting the aqueduct water. An energy dissipator was developed to deal with these problems, comprising tubes of varying length filled with furnace welded steel balls and placed inside a water main. Cavitation was able to occur within the dissipator and blockage was efficiently cleared out from it with no damage to the unit. The water agency which services the San Bernardino mountain area has equipped each of its 27 turnouts with an energy dissipator. This increased its water costs; it must charge $250/acre ft, as compared to $70/acre foot charged by valley agencies. However, because environmental considerations are so compelling, and because of health department actions against wells, about 6% more customers per year are using the water from the Feather River Aqueduct. The new energy dissipator permits this water to be distributed safely and efficiently. (Beale-FIRL)
W76-03212

PRIVATE CONSTRAINTS ON GROUNDWATER CONTAMINATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
Journal of the Hydraulics Division Proceedings of ASCE, Vol 101, No HY10, p 1333-1341, October, 1975. 29 refs.

Descriptors: *Groundwater, *Water rights, *Water quality control, *Water pollution control, Hydrologic aspects, Legal aspects, Water pollution sources, Water supply.

While water rights have been supplemented by direct governmental controls in the case of surface waters, protection of groundwater quality has been inadequate. Various judicial decisions regarding the rights of a groundwater user to an uncontaminated water supply are presented. The interpretations of court cases showed no clear patterns of legal action. In many cases, potential sources of groundwater pollution are essentially unregulated, and in cases where penalties for groundwater contamination do exist, there is no means for assuring recovery of losses. A 1970 survey indicated that groundwater constituted about one-third of public water supplies and provided about 95% of water used by 41 million people served by private domestic systems in the United States. It was strongly recommended that more comprehensive and effective controls are needed to supplement the mechanism of water rights and to protect the domestic water supplies. (Kramer-FIRL)
W76-03244

ECONOMIC ASPECTS OF GEOELECTRICAL PROSPECTING IN SANDSTONE AQUIFERS,
Birmingham Univ. (England). Dept. of Geological Sciences.
P. F. Worthington.
Water Services (G.B.), p 181-183, May 1975. 2 ref.

Descriptors: *Aquifers, *Exploration, *Resistivity, *Hydrogeology, Surveys, Sandstones, Europe, Aquifer characteristics, Mapping, Cost comparisons, Water quality, Boreholes.
Identifiers: England.

A frequent claim is made that the application of geophysical methods in hydrogeological studies can result in large monetary savings. These claims are particularly substantiated in cases of geoelectrical investigations of water-saturated sands and sandstones. This contribution indicates quantitatively the savings that can be made if geoelectrical methods are used in hydrological investigations of a consolidated sandstone aquifer. It is shown that savings can be made through a more rapid delineation of the aquifer boundaries, greater precision in mapping variations in aquifer thickness and therefore, to some extent, transmissivity, and a more reliable determination of zones of good water quality. In consequence, there are decided reductions in drilling and water treatment costs. The basic data presented are based on experience gained during a six-year hydrogeophysical survey of the Bunter Sandstone of Northwest Lancashire, England. It is demonstrated that the geoelectrical delineation of aquifer boundaries can be achieved with drastic savings over the alternative use of trial boreholes, provided that workable resistivity contrasts exist between different formations. (Carpenter-Wisconsin)
W76-03276

THE USE OF A DIGITAL MODEL IN THE MANAGEMENT OF THE CHALK AQUIFER IN THE SOUTH DOWNS, ENGLAND,
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown, R. A. Downing, and R. A. Monkhouse.
Journal of Hydrology, Vol 27, No 1/2, p 127-142, October 1975. 8 fig, 1 tab, 7 ref.

Descriptors: *Groundwater movement, *Aquifer management, *Safe yield, *Saline water intrusion, *Computer models, Subsurface waters, Groundwater recharge, Groundwater availability, Drawdown, Natural recharge, Water resources development, Aquifers, Model studies, Mathematical models, Infiltration.
Identifiers: *Chalk aquifers, *South Downs(England), Optimum yield.

A digital model was used to describe the transient effects of natural infiltration and abstraction on the movement of groundwater, and as a tool to assist with the long-term management of the Chalk aquifer of the South Downs. The primary aim of the study was to estimate the maximum yield of the aquifer, including saline intrusion, both from the sea and from tidal rivers. After the model had been calibrated, several experiments were performed with reference to the long-term development and operation of the aquifer. Abstraction regimes, designed to maximize final storage in the aquifer, were generated automatically by the model, using a dynamic programming approach. Under conventional methods of development, the conditions likely to prevail at the limit of develop ment, particularly at the end of an extended perio of limited infiltration, were investigated and the influence on future management proposals co sidered. The possibility of extending the develo ment limit by means of artificial recharge was al studied using the model. (Prickett-ISWS)
W76-03356

A SUMMARY OF THE BIOGEOCHEMISTR OF NITROGEN COMPOUNDS IN GROUN WATER,
California State Univ., Chico.
For primary bibliographic entry see Field 5B.
W76-03358

APPLICATIONS OF ELECTRO-OSMOSIS GROUND-WATER FLOW PROBLEMS,
University Coll. of Swansea (Wales). Dept. Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-03362

C. E. JACOB'S STUDY ON THE PROSPECTI AND HYPOTHETICAL FUTURE OF THE M ING OF THE GROUND WATER DEPOSIT UNDER THE SOUTHERN HIGH PLAINS TEXAS AND NEW MEXICO,
New Mexico Inst. of Mining and Technol Socorro.
W. Brutsaert, G. W. Gross, and R. M. McGehe
Ground Water, Vol 13, No 6, p 492-
November-December 1975. 16 fig.

Descriptors: *Groundwater mining, *Allu aquifers, *Aquifer systems, *Groundwater m ment, *Groundwater recharge, *New Mex *Terms, Steady flow, Unsteady flow, Stor Hydraulic conductivity, Specific yield, Hydr gy.
Identifiers: *Ogallala aquifer.

From 1965 until his death in 1970, Professor Jacob was chariman of Ground-Water Hydro at New Mexico Institute of Mining and Tech gy. During the last three decades, groundw studies have advance considerably due to hi forts, original achievements, and philosophie is considered one of the founders of mo groundwater hydrology. In this study, taken unpublished reports and notes, Jacob project decline of the water table in the Ogallala aquif the Southern High Plains of New Mexico Texas. After developing approximate analy solutions for steady and unsteady flow as a tion of flow depth, slope, water-table confi tion, and recharge, numerical results were tained by digital computation. Represent values of porosity and hydraulic conduct required for this purpose, were obtained fro analysis of well data. Jacob concluded tha hypothetical time required for drainin aquifer, without pumping and without rechar from 5000 to 8000 years. At pumping rates pr ing during the decade 1951-1960, with n recharge and discharge operating, the aquif be depleted in less than 100 years. Startin complete exhaustion, the aquifer would reco within 2% of initial (1938) storage in 5600 t years. If pumpage had ceased at the end of recovery to within 2% initial storage probably not exceed 1500 years. These esti assume that no local or temporary climatic fl tions of the water table take place during th spans considered. (Gibb-ISWS)
W76-03363

HEXAVALENT CHROMIUM IN THE GR WATER IN PARADISE VALLEY, ARIZON
Delaware Univ., Newark. Water Res Center.
F. N. Robertson.
Ground Water, Vol 13, No 6, p 5
November-December 1975. 7 fig, 1 tab, 29 re

escriptors: *Water chemistry, *Groundwater, lluvial aquifers, *Arizona, *Chromium, ydrogen ion concentration, Oxidation-reduction tential, Water quality, On-site investigations, mpling, Analysis, Pollutants, Water pollution urces.
entifiers: *Paradise Valley(Ariz), *Hexavalent romium.

exavalent chromium, Cr(+6), of natural origin s been found in the groundwater in Paradise lley, Maricopa County, Arizona. The concentions exceed 0.05 mg/1, the U. S. Public Health rvice's upper limit for Cr(+6). Paradise Valley a northwest-trending, down-faulted basin of out 225 sq mi, located in the semi-arid Basin and nge physiographic province. The accumulation fine-grained sediments (in part gypsiferous) ar the center of the basin indicateds that the aterial was deposited in a playa-type sedimentaenvironment. The Cr(+6) is present in the oundwater in a 75-sq mi area and forms an elonte northwest-trending pattern in the southern rt of the basin. The largest Cr(+6) concentrans are located in the approximate center of this ttern and decrease toward the margins. The (+6) distribution in the groundwater corsponds to the location of the fine-grained part of e alluvial deposits; the highest Cr(+6) concenations are associated with the finest-grained sedients. Evidence indicates that the Cr(+6) is fairly enly distributed vertically in the groundwater, at ast throughout the finer-grained part of the uifer system. Thermodynamic calculations and n and pH measurements of the groundwater incate that the water containing Cr(+6) is oxidizg and alkaline enough to account for the obrved concentrations. An alkaline environment, rgely a result of primary silicate hydrolysis in the ne-grained sediments, allows chemical oxidation the trivalent chromium to the soluble Cr(+6). ibb-ISWS)
76-03364

ULSE-TESTING RESPONSE FOR UNEQUAL ULSE AND SHUT-IN PERIODS,
moco Production Co. Tulsa, Okla.
. Kamal, and W. E. Brigham.
ociety of Petroleum Engineers Journal Vol 15, o 5, p 399-410, October 1975. 16 fig, 11 ref, 1 apnd.

escriptors: *Oil reservoirs, *Pumping, Drawdown, *Confined water, Mathematics, Unady flow, Wells, Equations, Aquifer characristics, Groundwater, Aquifer testing, Aquifers, esting, Reservoirs, Mathematical studies, Test ells, Pressure head, Water pressure, Computer ograms.
entifiers: *Pressure response, *Cyclic pumpage, mensionless curves, *Pulse testing.

theoretical study was carried out to develop the neral equations relating time lags and response nplitudes to the length of the pulse cycles and the lse ratios of these cycles for pulse tests with equal pulse and shut-in times. These variables ere related to the reservoir parameters using appopriate dimensionless groups. The equations ere developed by using the unsteady-state flow odel of the line source for an infinite, homogeneis reservoir that contains a single-phase, slighly mpressible fluid. A computer program was writn to calculate the values of the three correspondg time lags and the response amplitudes at given mensionless cycle periods and pulse ratios using ese general equations. For different values of e pulse ratio ranging from 0.1 to 0.9, the time lags d response amplitudes were calculated for mensionless cycle periods ranging from 0.44 to 04. This range of cycle period and pulse ratio vered all practical ranges over which pulse testg can be used effectively. Curves relating the mensionless time lag to the dimensionless cycle riod and the dimensionless response amplitude ere constructed for each case. It was also found at both the dimensionless cycle period and the dimensionless response amplitude could be represented as simple exponential functions of the dimensionless time lag. The coefficients of these relations are functions only of the pulse ratio. (Prickett-ISWS)
W76-03371

NEW TRITIUM DATA ON MOVEMENT OF GROUNDWATER IN WESTERN FRESNO COUNTY, CALIFORNIA,
Geological Survey, Sacramento, Calif.
For primary bibliographic entry see Field 5B.
W76-03388

MIXING OF THERMAL AND NONTHERMAL WATERS IN THE MARGIN OF THE RIO GRANDE RIFT, JEMEZ MOUNTAINS, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2K.
W76-03393

CHEMICAL QUALITY OF GROUND WATER IN THE NORTHERN PART OF THE ALBUQUERQUE-BELEN BASIN, BERNALILLO AND SANDOVAL COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-03394

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1975,
Geological Survey, Garden Grove, Calif.
For primary bibliographic entry see Field 7C.
W76-03396

HYDROLOGY OF THE SOUTH PLATTE RIVER VALLEY, NORTHEASTERN COLORADO,
Geological Survey, Denver, Colo.
R. T. Hurr, P. A. Schneider, Jr., and D. R. Minges.
Colorado Water Conservation Board, Denver, Water Resources Circular No 28, 1975. 24 p, 13 fig, 5 plate, 1 tab, 28 ref.

Descriptors: *Irrigation water, *Water yield, *Surface waters, *Groundwater, *Hydrologic data, Water quality, Water yield, Water management(Applied), Diversion, Hydrology, Evaluation, *Colorado.
Identifiers: *South Platte River valley(Colo).

The study area occupies about 950 sq mi along the South Platte River between Henderson, Colo., and the Colorado-Nebraska State line and is underlain by valley fill containing an unconfined aquifer which is in hydraulic connection with the South Platte River. The principal use of the water is for irrigation. During 1947-70 the surface-water diversions averaged 981,000 acre-ft annually, and groundwater diversions averaged 420,000 acre-ft annually. Groundwater seepage to the river decreased by about 250,000 acre-ft per year, and groundwater storage decreased by 456,000 acre-ft. About 45 to 50 percent of the applied irrigation water recharges the groundwater system, a large part of which ultimately seeps into the river. Owing to the consumption losses, however, the recharged groundwater is higher in dissolved solids than the applied irrigation water so that there is a general increase in dissolved-solids concentration in a down-gradient and a down-valley direction. There also tends to be an increase in dissolved-solids concentration in the river in a down-valley direction. In the South Platte River valley, surface water and groundwater are the components of one hydraulic system, and an analysis of water-management practices must consider the interrelation between them in quantitative terms. The description of the system and its operation as presented provide a foundation upon which such analysis can be made. (Woodard-USGS)
W76-03398

ANALOG MODEL STUDY OF THE HYDROLOGY OF THE SAN LUIS VALLEY, SOUTH-CENTRAL COLORADO,
Geological Survey, Denver, Colo.
P. A. Emery, E. P. Patten, Jr., and J. E. Moore.
Colorado Water Conservation Board, Denver, Water Resources Circular No 29, 1975. 21 p, 8 fig, 13 plate, 2 tab, 12 ref.

Descriptors: *Water resources, *Irrigation water, *Hydrology, *Analog models, *Colorado, Surface waters, Groundwater, Water wells, Aquifer characteristics, Water yield, Drawdown, Evaluation, Withdrawal, Groundwater movement, Forecasting.
Identifiers: *San Luis valley(Colo).

The San Luis Valley of south-central Colorado is one of the most productive irrigated areas of the State. Groundwater from unconfined and confined aquifers, and surface water are used to sustain crop production. A three-layer electric analog model that simulated the upper 3,120 feet of the valley-fill aquifer was constructed as part of a study of the San Luis Valley by the U.S. Geological Survey. The model simulates hydrologic boundaries, storage, trasmissivity, and interconnection of the aquifers. It consists of three interconnected resistor grids or layers which simulate the unconfined aquifer and the upper and lower parts of the confined aquifer. Water withdrawn from the upper part of the confined aquifer is derived from six sources: storage in the upper part of the confined aquifer, storage in the lower part of the confined aquifer, storage in the unconfined aquifer, salvaged evapotranspirtation, the Rio Grande, and the Conejos River. The analog analyses indicate that significant amount of nonbeneficial evapotranspiration is salvaged as a result of withdrawing water from the confined aquifer. Analog analyses also show that present groundwater withdrawal from the confined aquifer south of the Rio Grande depletes the flow of the Conejos River by an amount nearly 50 times greater than withdrawal from wells north of the Rio Grande. (Woodard-USGS)
W76-03403

WATER QUALITY, FOUNTAIN AND JIMMY CAMP VALLEYS, COLORADO, 1973,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-03404

LEGAL CONTROLS FOR PROTECTING UNDERGROUND SOURCES OF DRINKING WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5F.
W76-03435

CONTAMINANTS IN RAINWATER AND THEIR RELATION TO WATER QUALITY, PART II,
Suffolk County Dept. of Environmental Control, N. Y.
For primary bibliographic entry see Field 5A.
W76-03445

4C. Effects On Water Of Man's Non-Water Activities

WINTER SOIL WATER DYNAMICS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2G.
W76-03002

A TIMBER-WATER SIMULATION MODEL FOR LODGEPOLE PINE WATERSHEDS IN THE COLORADO ROCKIES,
Colorado State Univ., Fort Collins, Dept. of Forest and Wood Sciences.
For primary bibliographic entry see Field 4D.
W76-03167

TWO DECADES OF FLOOD-PLAIN MANAGEMENT: THE TVA REGIONAL EXPERIENCE,
Tennessee Valley Authority, Knoxville. Local Flood Relations.
For primary bibliographic entry see Field 6F.
W76-03271

STUDIES OF SELECTED PRECIPITATION CASES FROM METROMEX.
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-03353

THE EFFECT OF TIMBER REMOVAL ON THE STABILITY OF FOREST SOILS,
Forest and Range Experiment Station, Rangiora (New Zealand). Div. of Protection Forestry.
C. O'Loughlin.
Journal of Hydrology (New Zealand), Vol 13, No 2, p 121-134, 1974. 7 fig, 4 tab, 22 ref.

Descriptors: *Forest soils, *Forest watersheds, Piezometers, Seepage, Cohesion, Root development, Slopes, Sheer stress, Pore water, Lumbering, Lumber, Pressure.
Identifiers: *New Zealand, Forest cover, Deforestation, Soil movement, Hill country, Soil cohesion, Winch, Scaler, Shear box.

The principal ways in which the removal of a forest cover influences the stability of sloping soils were briefly described. In order to review the cause-and-effect relationships between deforestation and mass soil movements, particularly landslides, simple slope stability analyses were applied to an infinite slope under dry and saturated conditions. The methods by which relevant soil physical data can be obtained for use in stability analysis were outlined. Although the analyses were fraught with uncertainties, they illustrated how deforestation could effect changes in the stability of steep slopes. In New Zealand, where an expanding timber industry had its eye on large tracts of commercially valuable forests established on steep hill country, the need for soil physical data was obvious. (Roberts-ISWS)
W76-03361

WATER AND THE SOUTH FLORIDA ENVIRONMENT,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 5C.
W76-03402

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-03406

SOME INITIAL EFFECTS ON WATER QUANTITY AND QUALITY OF AN EXPERIMENTAL ROADING AND TIMBER HARVESTING OPERATION IN A VICTORIAN MOUNTAIN CATCHMENT,
Melbourne and Metropolitan Board of Works (Australia).
P. N. Kriek, and P. J. O'Shaughnessy.
Report No. MMBW-W-0002, 1975. 20 p, 10 fig, 4 tab, 2 ref.

Descriptors: *Forest watersheds, *Clear-cutting, *Water quality, *Water yield, *Australia, Forest management, Watershed management, Soil moisture, Streamflow, Watersheds(Basins), Vegetation effects, Road construction, Rainfall-runoff relationships.
Identifiers: Eucalyptus-regnans, Central Highlands(Vic.).

Studies on three experimental catchments supporting mature Eucalyptus regnans forest in the Central Highlands of Victoria (Australia), are reported. A highly significant increase in streamflow yield in the two years following a total clear-felling forest operation is demonstrated, with much less significant increases in the year following an operation which removed approximately fifty percent of the stand. Six water quality parameters during base flow periods indicated a significant deterioration in the short term, with a tendency to recovery becoming apparent. (CSIRO)
W76-03447

CHANGE IN YIELD OF WATER FOLLOWING A BUSHFIRE IN A FOREST OF EUCALYPTUS REGNANS,
Melbourne and Metropolitan Board of Works (Australia).
K. J. Langford.
Report No. MMBW-W-0003, 1975. 53 p, 13 fig, 17 tables, 34 ref.

Descriptors: *Forest fires, *Forest watersheds, *Water yield, *Vegetation effects, *Australia, Watersheds(Basins), Rainfall-runoff relationships, Streamflow, Water supply, Water loss, Costs.
Identifiers: Eucalyptus-regnans, Melbourne(Vic.).

Previous observations have indicated that the effects of forest regeneration following severe bushfires in the catchment areas of Melbourne (Australia) in 1939 included in a reduction in streamflow from the area. A historical study is reported which establishes the statistical significance of this reduction, assesses its economic importance, and considers its likely causes. Preliminary evidence of a tendency for streamflows to return to pre-1939 levels is reported. (CSIRO)
W76-03449

THE INFLUENCE OF LAND USE ON STREAM SALINITY IN THE MANJIMUP AREA, WESTERN AUSTRALIA.
Western Australian Department of Agriculture Technical Bulletin No. 27, December 1974, 32 p, 13 tab, 6 fig, 20 ref, append. Report compiled by a Study Group (Ed. C.H. Trotman).

Descriptors: *Land clearing, Forestry, *Salinity, *Streams, *Australia, *Land use, Rainfall, Arid lands, Lumbering, Model studies, Regression analysis, *Forest management.
Identifiers: Manjimup(W.A.).

A review of the history of land use and stream salinity in a proposed wood-chip area in southwest Western Australia indicated that increases in salinity were associated with clearing for agriculture in areas receiving less than 1000 mm annual rainfall. Areas receiving more than 1,100 mm annual rainfall appear to reach a new and lower salinity equilibrium following forestry or clearing after 18 to 145 years. Modelling for salt and water balances in a particular 45,000 ha catchment predicted that agricultural development alone would produce larger salinity increases than cutting for wood-chips, but that the two effects were likely to be additive. It is noted that multiple regression analysis of relevant catchment factors would offer a useful means of rating potential contributors to stream salinity. (CSIRO)
W76-03452

4D. Watershed Protection

FLOW FORECASTING FOR THE BULL RUN WATERSHED,
Multinomah County Div. of Planning and Development, Portland, Oreg.
G. G. Palmer.
Journal American Water Works Association, Vo 67, No. 11 p 608-611, November 1975. 3 fig.

Descriptors: *Model studies, *Flood forecasting *Design storm, *Probable maximum precipitation *Landslides, *Oregon, Forest management, Spill ways, Reservoirs, Erosion control, Synthetic hydrology.
Identifiers: *Bull Run Reservoir(Ore), Hydocomp simulation program.

As a result of a 1972 landslide in the Bull Run are of Oregon, a simulation of the hydrologic behavio of the watershed was undertaken to assess th safety of the existing spillway structure for a floo generated by a standard project storm and to guar against any future occurrence of slides. The in vestigative team elected to use the Hydrocom Simulation Program, which is founded on th Stanford University water-shed model. Pertinen physical, geological, meteorological and hydrolog ical information was collected and the mode calibrated. Standard project storm ranged betwee 40 and 60% of the probable maximum precipita tion. The spillway was found safe for the standar project flood. However, some erosion-contro measures and strengthening of the stilling basi were indicated. Simulation of watershed behavio was helpful in providing flows to serve as basis fo engineering calculation. (Singh-ISWS)
W76-03109

THE OFF-SITE SEDIMENT DAMAGE FUNC TION IN SELECTED ILLINOIS WATERSHEDS
Illinois Univ. at Urban-Champaign. Dept. o Finance.
K. L. Guntermann, M. T. Lee, and E. R. Swanson
Journal of Soil and Water Conservation, Vol 3 No 5, p 219-224, September-October 1975. 1 fig, tab, 28 ref.

Descriptors: *Sediments, *Sediment yiel *Illinois, Watersheds(Basins), Erosion, Agricu tural watersheds, Soil erosion, Reservoir siltin Economic impact, Damages, Estimating.
Identifiers: *Sediment damage, *Off-site sedimen damage, Agricultural practices, Economic analy sis.

Estimates of the off-site sediment damage cos for selected agricultural watersheds in Illinois i dicated that these costs typically are 10 to 15% private net income and can be much higher und contemporary farming techniques. In additio off-site damage costs appear to be many time larger than on-site sediment damage cos (production effects). This suggested that soil co servation efforts should be refocused to inclu considerations of the social costs caused by of site sediment damages. (Lee-ISWS)
W76-03126

WIND EROSION: UNIFORMLY SPACIN NONERODIBLE ELEMENTS ELIMINATES E FECTS OF WIND DIRECTION VARIABILITY,
Agricultural Research Service, Manhattan, Kans
L. Lyles, and B. E. Allison.
Journal of Soil and Water Conservation, Vol 3 No 5, p 225-226, September-October 1975. 4 fig, ref.

Descriptors: *Wind erosion, *Wind velocity, Er sion, Erosion control, Winds, Crops, Agricultur Soil erosion.
Identifiers: *Wind tunnels, *Wind direction, Cr spacing, Crop height, Crop equidistant spacing.

d tunnel studies suggested that equidistant ing of nonerodible elements, such as plants at ous populations, provides equal protection wind erosion, regardless of wind direction. protection equals that of elements in rows nted normally (perpendicular) to wind ction (row spacing in experimental data did not ed 61 cm). These observations assumed equal bers of elements per unit area for any orienta- (Lee-ISWS)
-03127

TER QUALITY IN A TROPICAL RAIN ESTED CATCHMENT,
versity of New England, Armidale (Australia). t. of Geography.
primary bibliographic entry see Field 5B.
-03132

DELS OF LAND AND WATER ALLOCA- N TO IMPROVE ENVIRONMENT AND TER QUALITY THROUGH SOIL LOSS TROLS,
State Univ., Ames. Center for Agricultural Rural Development; and Iowa State Univ., s. Dept. of Economics.
primary bibliographic entry see Field 5G.
-03164

TIMBER-WATER SIMULATION MODEL LODGEPOLE PINE WATERSHEDS IN COLORADO ROCKIES,
rado State Univ., Fort Collins, Dept. of st and Wood Sciences.
. Betters.
er Resources Research, Vol 11, No 6, p 903- December 1975. 3 fig, 2 tab, 19 equ, 32 ref.

criptors: *Timber, *Water yield, tersheds(Basins), *Forests, Hydrology, ulation analysis, Management, Long-term ning, Effects, *Colorado, *Rocky Mountain on, Lodgepole pine trees, Estimating, Natural urces, Decision making, Equations, Computer rams, Systems analysis, Mathematical els.
tifiers: Prediction, Multiple-use concept, Sub- els.

terministic, dynamic joint production simula- model was developed to predict annual timber water yields over an extended time period. model provides for testing the long-term ef- of various managerial strategies and thus acts n aid to analyzing and studying proposed agement plans. The simulation may be applied dgepole pine subalpine watersheds along the rado Rocky Mountain Front Range region. input requirements for the simulation include l stand conditions, stable site characteristics, rshed location along the Front Range, and the osed timber-harvesting schedule. The simula- vas tested by comparing model predictions to rved records of two Colorado watersheds. average error of estimation in predicting long- water yields was about 14%.
-03167

RID FORMULATION OF KINEMATIC VE MODELS OF WATERSHED RUNOFF,
Mexico Institute of Mining and Technology, rro.
primary bibliographic entry see Field 2E.
-03355

ESTIMATE OF TOTAL SURFACE AREA OF ETATION FOR PUKEITI CATCHMENT, THLAND, NEW ZEALAND,
stry of Works and Development, Nelson v Zealand).
. Burke.
nal of Hydrology (New Zealand), Vol 13, No 115-120, 1974. 3 fig, 1 tab, 7 ref.

Descriptors: *Interception, *Cover crops, *Vegetation effects, *Evaporation, Canopy, Leaves, Stemflow, Runoff, Rainfall.
Identifiers: *New Zealand, *Manuka, *Surface index.

Calculation of the total surface area of vegetation in a catchment was proposed to estimate the amount of surface active in rainfall interception and evaporation. Mapping and sampling of vegetation in the Pukeiti catchment, which has a ground surface area of 1.45 ha and a vegetative cover of Leptospermum scoparium J. R. and G. Forst. (manuka) scrub, was accomplished by a technique described in the paper. The computed total surface area of the manuka, including twigs, branches, stems, and leaves (one side only), was 1.04 ha. The ratio of vegetative surface area to ground surface area, tentatively labeled the surface area index, was 0.72 with a standard error of 0.06. Previous studies had implied a value on the order of 1.2 for the ratio of vegetative surface area to ground surface area in a similar catchment. (Bender-ISWS)
W76-03360

THE EFFECT OF TIMBER REMOVAL ON THE STABILITY OF FOREST SOILS,
Forest and Range Experiment Station, Rangiora (New Zealand). Div. of Protection Forestry.
For primary bibliographic entry see Field 4C.
W76-03361

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

WATER QUALITY IN IOWA STREAMS: SUMMARY OF A CONFERENCE HELD MARCH 1975.
Iowa State Univ., Ames. Dept. of Animal Ecology.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 459, $5.00 in paper copy, $2.25 in microfiche. Conference Proceedings, Iowa State Water Resources Research Institute, Ames, No 73, March 1975. 86 p, 8 fig, 7 tab, 334 ref, 2 append. OWRT A-999-IA(9).

Descriptors: *Water quality, *Streams, *Iowa, *Conferences, *On-site investigations, *Sampling, *Aquatic environment, Mississippi River, Agricultural chemicals, On-site data collections, Biota, Reservoirs, Diatoms, Dieldrin, Algae, Phosphates, Nitrates, Coliforms, Fish, Aquatic insects, Dissolved oxygen, Turbidity, Ammonia, Temperature, Trace elements, Tile drainage, Carbon dioxide, Hardness(Water).

On March 4, 1975, a conference on water quality in Iowa streams was held on the Iowa State University campus. The purpose was to bring together those individuals within Iowa who are actively engaged in research on stream water quality and the factors that determine it and to promote discussion regarding any conclusions, hypotheses, or unsolved questions relative to water quality in Iowa streams with the goal of increasing the effectiveness of research programs. This three-part publication is intended to serve as a summary of the conference and to document available past and current work on Iowa streams. Part I contains titles and abstracts of the talks given at the conference. Part II is a bibliography of papers and reports dealing with stream water quality in Iowa. Part III summarizes current sampling programs on specific Iowa streams. Information regarding study reach, sampling schedules, parameters measured, methods of analyses, and data availability are given in alphabetical order by stream. The last two sections were based in part on questionnaires distributed to various investigators prior to and during the conference. The conference achieved its objectives. The participants were exposed to a great diversity of research areas and approaches, and many informative discussions developed. This summary should serve as a baseline for stream water quality work in Iowa and provide a starting point for further investigations in this area.
W76-03004

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES--II. CHEMICAL STABILIZATION,
Geological Survey, Menlo Park, Calif.
P. Avotins, and E. A. Jenne.
Journal of Environmental Quality, Vol 4, No 4, p 515-519, October-December, 1975. 8 fig, 2 tab, 12 ref.

Descriptors: *Water chemistry, *Chemical reactions, *Mercury, *Stability, *Aqueous solutions, Solutes, Volatility, Solubility, Storage, Time, Laboratory tests, Bacteria, Analytical techniques, Evaluation, Organic acids.
Identifiers: *Sample preservation, Oxidizing agents.

Bacteria were found to be the principal cause of instability of mercury in laboratory solutions. The volatilization loss rate increased rapidly after a variable lag period and then leveled off with increasing time. The marked reduction in the loss rate of mercury is a result of its combination with bacterial cells and metabolites. Reagents which either oxidize or solubilize organics removed mercury most effectively from sample containers in which mercury-bearing water had been stored. A small amount of mercury was found to have diffused into the polvethylene bottles. Solute mercury was most effectively stabilized in laboratory solutions and water samples with 0.05% KMnO4 without acidification. (Woodard-USGS)
W76-03009

METHOD AND APPARATUS FOR DETECTING THE DEGREE OF CONTAMINATION OF WASTE WATER,
Katsuhiki Hayashi, Tokyo (Japan). (Assignee).
S. Sema, and I. Sakurada.
U S Patent No 3,917,945, 5 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 489, November 4, 1975.

Descriptors: *Patents, *Waste water, *Waste identification, *Water pollution sources, Fluorescence, X-ray fluorescence, *Pollutant identification, Analytical techniques.

A method and apparatus is described which is capable of continuously determining all contamination components contained in waste water discharged in large quantity. Lights from light sources are projected upon a constant flow of the waste water and the quantity of the luminescence emitted by the constant flow and the quantities of the infrared rays and of the ultraviolet rays absorbed by the constant flow are measured simultaneously and the result of the measurement is analyzed by a computer to determine the degree and type of the contamination. The result of the analysis is recorded on a recording chart. The quantities of fluorescent oil component and the solid components are directly determined from the intensity of fluorescence and the absorption of the infrared light, respectively. The quantity of the oil components that do not fluoresce can be determined by subtracting the absorption for the ultraviolet light corresponding to the other oil components and the quantity of the absorbed infrared light from the quantity of the absorbed ultraviolet light. Thus, the quantities of the fluorescent oil, the non-fluorescent oil and the solid particles are determined separately. (Sinha-OEIS)
W76-03014

SPECTRAL ANALYSIS OF OLFACTORY RESPONSES TO AMINO ACIDS IN RAINBOW TROUT, SALMO GAIRDNERI,
Tokyo Univ. (Japan). Zoological Inst.; and Tokyo Univ. (Japan). Faculty of Sciences.
For primary bibliographic entry see Field 5C.
W76-03017

MERCURY AND IRON UPTAKE BY CYTOSOMES IN MANTLE EPITHELIAL CELLS OF QUAHOG CLAMS (MERCENARIA MERCENARIA) EXPOSED TO MERCURY,
National Inst. of Environmental Health Sciences, Research Triangle Park, N.C. Environmental Toxicology Branch.
For primary bibliographic entry see Field 5C.
W76-03027

THE INFLUENCE OF ACTIVITY LEVEL ON BRADYCARDIA IN TROUT (SALMO GAIRDNERI) DURING HYPOXIA,
Boston Univ., Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-03031

IMPROVED FLOWING WATER APPARATUS FOR THE CULTURE OF BRACHYURAN CRAB LARVAE,
Oregon State Univ., Newport. Marine Science Center.
D. V. Buchanan, M. J. Myers, and R. S. Caldwell.
Journal of the Fisheries Research Board of Canada, Vol 32, No. 10, p 1880-1883, 1975. 2 fig, 1 tab, 11 ref.

Descriptors: *Design, *Methodology, Technology, *Flow system, Laboratory tests, Toxicity, *Crabs, Crustaceans, Growth stages, Tests, Cultures.
Identifiers: *Flowing water system, Cancer magister.

A flowing water system was described for culture of brachyuran crab larvae. This system, which is suitable for toxicant exposure studies, employed a flow reversal principle and a minimal area of screen placed low on the side of the culture containers. The design minimized the problem of larval entrapment in water exit screens. Survival of cancer magister zoere in rearing tests lasting up to 60 days compared favorably with survivals obtained previously using static culture methods. (Klein)
W76-03035

APPARATUS FOR CONTINUOUSLY SATURATING WATER WITH HYDROPHOBIC ORGANIC CHEMICALS,
National Water Quality Lab., Duluth, Minn.
G. D. Veith, and V. M. Comstock.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1849-1851, 1975. 2 fig, 6 ref.

Descriptors: Technology, *Methodology, *Design, Toxicity, Laboratory studies, Bioassay, Organic wastes.
Identifiers: *Water saturation, *Hydrophobic organic chemicals.

An apparatus for generating and maintaining water solutions saturated with hydrophobic organic chemicals was described. The saturator replaced the reagent stock bottle and the organic solvents used in conventional diluters and had ample capacity to dose large volumes of water necessary for long-term toxicology studies with aquatic organisms. The water in a constant-level reservoir was continuously saturated with the chemical by circulating the water through a bed of an inert substrate impregnated with the chemical under investigation. (Klein)
W76-03047

PROPORTIONAL DILUTER FOR EFFLUENT BIOASSAYS,
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
C. W. Riley.
Journal of the Water Pollution Control Federation, Vol 47, No 11, p 2620-2627, 1975. 5 fig, 3 ref.

Descriptors: *Waste dilution, *Bioassay, *Methodology, Design, *Effluents, Laboratory tests, Toxicity, Water quality, *Pollutant identification.
Identifiers: *Continuous flow dilution, *Proportional diluter.

The Wuerthele and Riley proportional diluter was a continuous flow diluting device designed to be used in on-site bioassays of complex industrial and municipal wastewater effluents, using the receiving water as diluent. This diluter provided a reasonable flow rate of test solution per gram of fish (31/g/day) that accommodated 104 g of fish/test unit and, when used with the described bioassay containers, provided a 99 percent replacement time of less than 30 minutes. Testing with a weak acid solution and a salt solution revealed that this new diluter delivers test solution concentrations well within the accepted tolerance limits of plus or minus 5 percent. The testing also showed that there is no measurable difference in the concentration of test solution delivered to replicate test containers. The Wuerthele and Riley proportional diluter was easily assembled and maintained. It was constructed of durable acrylic plastic which made it adaptable to many mobile laboratory installations and portable field operations. (Klein)
W76-03051

PROBLEMS ASSOCIATED WITH LOW-SOLUBILITY COMPOUNDS IN AQUATIC TOXICITY TESTS: THEORETICAL MODEL AND SOLUBILITY CHARACTERISTICS OF AROCLOR 1254 IN WATER,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
W. P. Schoor.
Water Research, Vol 9, p 937-944, 1975. 3 fig, 8 tab, 14 ref.

Descriptors: *Theoretical analysis, *Solubility, *Methodology, *Bioassay, Analytical techniques, Aquaeous solutions, Toxicity, Water chemistry, Aroclors, Testing, Pollutant identification.
Identifiers: *Aroclor 1254.

A theoretical model of the behavior of substances having low water-solubility was presented and discussed with respect to aqueous bioassay. Ultracentrifugal techniques were used in an attempt to study size distributions of Aroclor 1254 aggregates in aqueous emulsions. Results indicated strong adsorption from emulsion by surfaces and a water-solubility at 20C of less than 0.1 micrograms/liter in distilled water and approximately 40% of that value in water containing 30g/l NaCl. Implications with regard to aqueous bioassay were discussed. (Klein)
W76-03052

POLAROGRAPHIC DETERMINATION OF ARSENIC IN INDUSTRIAL AND DRAINAGE WATERS (POLYAROGRAFICHESKOE OPREDELENIE MYSH'YAKA V PROMYSHLENNYKH I STOCHNYKH VEDAKH),
N. G. Elenkova, and R. A. Tsoneva.
Zhurnal Analiticheskoe Khimii, Vol 29, No 2, p 289-293, 1974. 3 fig, 4 tab, 11 ref.

Descriptors: Waste water treatment, *Industrial wastes, Analytical techniques, *Pollutant identification, *Arsenic compounds, Polarographic analysis, Heavy metals, Chemical precipitation, Drainage water.

A new polarographic method for the determinatio of arsenic in industrial and drainage water i proposed. Arsenic is coprecipitated on a Fe(OH) collector. After reducing and dissolving th precipitate in ascorbinic acid, the arsenic is dete mined polarographically in mixture of ascorbini and citric acids. The method is useful for fast an serial analyses in industrial laboratories. The sen sitivity of the method is 0.024 mg/liter, and th variation coefficient is 21% when 56 microgram of As are determined. The analysis is not inte fered with by Cu, Hg, Fe, Pl, Mu, Co, Ni, Se, T Ag, Zn, Au, Sb. (Murphy-FIRL)
W76-03068

AQUIFER EVALUATION USING DEPOS TIONAL SYSTEMS: AN EXAMPLES I NORTH-CENTRAL TEXAS,
Dames and Moore, Boca Raton, Fla.
For primary bibliographic entry see Field 2F.
W76-03111

ATMOSPHERIC REAERATION IN A RIVE USING PRODUCTIVITY ANALYSIS,
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5G.
W76-03115

FLUOMETURON AND WATER CONTENT DI TRIBUTIONS DURING INFILTRATION: ME SURED AND CALCULATED,
Oklahoma State Univ., Stillwater. Dept. Agronomy.
For primary bibliographic entry see Field 5B.
W76-03123

APPLICATION OF THE WIND EROSIO EQUATION IN AIR POLLUTION SURVEYS,
L. Wilson.
Journal of Soil and Water Conservation, Vol No 5, p 215-219, September-October 1975. 13 ref.

Descriptors: *Wind erosion, *Dusts, *Air pol tion, *Soil classification, *Vegetation effec *New Mexico, Control, Climatic data, Resistan Land management, Arid lands.
Identifiers: *Airborne particulates.

The wind erosion equation was applied to generalized and regional basis in several areas New Mexico for determining the extent of natu dust in the atmosphere. This application involv the use of wind erodibility ratings for soil assoc tions, protective effect of rangeland vegetati and roughness and climate variables. It was fou that even 0.3% of the calculated gross erosion dust load was enough to exceed air pollution st dards in some urban area. Expensive land u management practices to reduce such pollution not needed. Pollution control efforts need to channeled to areas where pollution is the dir result of human action and, therefore, subject reduction. Properly used, the wind erosion eq tion promises to be of considerable value in he ing separate naturally dusty areas from th where pollution is of immediate concern. (Sin ISWS)
W76-03125

ISOTOPIC COMPOSITION OF GROUN WATER IN SEMI-ARID REGIONS SOUTHERN AFRICA,
National Physical Research Lab., Pretoria (So Africa).
For primary bibliographic entry see Field 2K.
W76-03130

MOVEMENT OF HERBICIDES IN SOIL MASS FLOW,
Iowa State Water Resources Research In Ames.
For primary bibliographic entry see Field 5B.
W76-03134

IENOLS IN THE CLARK FORK RIVER,
ontana Univ., Missoula. Dept. of Chemistry.
or primary bibliographic entry see Field 5B.
76-03136

ATER QUALITY PERCEPTION BY USERS: AN IT SUPPLEMENT OBJECTIVE WATER UALITY MEASURES,
reat Lakes Forestry Research Center, Sault inte Marie (Ontario).
or primary bibliographic entry see Field 5G.
76-03168

JPPRESSION OF IRON (III) INTERFERENCE THE DETERMINATION OF IRON (II) IN ATER BY THE 1,10-PHENANTHROLINE ETHOD,
. Fadrus, and J. Maly.
nalyst, Vol 100, p 549-554, August, 1975. 2 tab, 4 , 8 ref.

escriptors: *Photometry, *Heavy metals, *Iron, Chelation, *Analytical techniques, Colorimetry, Pollutant identification, Nitrilotriacetic acid.
entifiers: Ion interference, Complexones, Mask-g.

method for the determination of iron (II) in ater in the presence of iron (III) with 1,10-enanthroline is described, in which the interfer-g effect of iron (III) ions is suppressed by mask-g with complexones. The advantages of compex-es, especially nitrilotriacetic acid (NTA) which as found to be most suitable, over other chelat-g agents are discussed. (Hoyle-Vanderbilt)
76-03169

REASE PROBLEMS IN MUNICIPAL WASTE-ATER TREATMENT SYSTEMS,
CA Engineering Corp., Baltimore, Md. Environ-ental Div.
or primary bibliographic entry see Field 5D.
76-03225

ASTE WATER TREATING OPERATION SING MICROBIAL MEMBRANE (I). ANALY-S OF RESISTANCE TO MOVEMENT WITHIN IQUID PHASE,
. Kubota, S. Omi, H. Tatsumi, and S. Waki.
eprint of the Chemical Engineering Society, okyo, Japan, p 92-93, 1975. 4 fig, 2 tab, 1 ref.

escriptors: *Flow rates, *Analytical techniques, Microorganisms, Membrane processes, Laminar ow, Pollutant identification, Waste water treat-ent.

he analysis of resistance to movement of oxygen the liquid phase was carried out by batch opera-on using two types of microbial membrane sup-orters. The first type of supporter allowed the action solution to be circulated as a laminar ow. The second type alternated the flow path of e solution every 5 cm. A cultivated solution con-ining 100 ppm glucose, 100 ppm pepton, 100 ppm 2HPO4, 50 ppm MgSO4, 50 ppm NH3Cl and 10 m FeCl2 was circulated at 25 C for 3 to 4 days at pH of 7.0 to 7.2 to allow the microbial membrane grow to about 100 microns. A solution contain-g 100 ppm glucose, 100 ppm K2HPO4, 50 ppm gSO4, 50 ppm NH4Cl and 10 ppm FeCl2 was ed to substitute the cultivated solution, and the reacted glucose was traced. The reduced sugar as analyzed by a Cu-colorimetric method. esults showed that flow rate significantly af-cted the reaction rate for the type one supporter t had no apparent effect on the type two sup-orter. (Su-FIRL)
76-03230

ODIFICATIONS IMPROVE CHLORINE CON-ACT CHAMBER PERFORMANCE, PART I,
Worcester Polytechnic Inst., Mass. Dept. of Civil ngineering.
For primary bibliographic entry see Field 5F.
W76-03231

METHODOLOGY FOR APPLICATION OF ADENOSINE TRIPHOSPHATE DETERMINATION IN WASTEWATER TREATMENT,
Biospherics Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W76-03232

AUTOMATED METHODS FOR ASSESSING WATER QUALITY COME OF AGE,
Technicon Industrial Systems, Tarrytown, N.Y.
M. J. F. DuCros, and J. Salpeter.
Environmental Science and Technology, Vol 9, No 10, p 929-933, 935, October, 1975. 2 fig, 5 tab, 2 ref.

Descriptors: *Waste water treatment, *Water quality control, *Automation, Analytical techniques, Equipment, Laboratory tests, Water analysis, Chemical analysis, *Pollutant identification.
Identifiers: Technicon AutoAnalyzer II Continuous-Flow Analytical system.

Automated wet chemistry instrumentation and methodologies for use in water quality laboratories of governmental regulatory agencies and municipal and industrial facilities are discussed with particular reference to equipment available from Technicon Industrial Systems. The Technicon AutoAnalyzer II Continuous-Flow Analytical system is a modular system capable of assaying substances at rates up to 60 samples/hour. The modular design permits the analysis of liquid, solid, or gaseous samples. Detection techniques can include colorimetry, spectrophotometry, flame photometry, fluorometry, atomic absorption spectroscopy and potentiometry. The Technicon Monitor IV system utilizes the same continuous-flow concept of the AutoAnalyzer for continuous on-site measurements. Automated analytical systems enable the user to handle larger analytical workloads more economically, and with improved precision and accuracy. The 1974 edition of EPA's Manual of Methods for Chemical Analysis of Water and Wastes states that instrumental methods have been selected over manual procedures because of their improved speed, accuracy and precision. Twelve procedures for the AutoAnalyzer II are included in the manual for laboratories with this equipment. Information on some of the typical users of automated analytical systems is presented. (Orr-FIRL)
W76-03233

ION ACTIVITY ELECTRODE METHOD YIELDS CHLORIDE ION CONCENTRATION,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
E. Hindin.
Water and Sewage Works, Vol 5, No 9, p 60-62, September, 1975. 3 tab, 7 ref.

Descriptors: *Chlorides, *Ions, *Analytical techniques, Hydrogen ion concentration, Waste water treatment, *Electrodes, *Pollutant identification, Correlation analysis, Chemical precipitation.

Data gathered during a study conducted in 1974 indicate that the ion specific electrode method can be used in lieu of the standard mercuric nitrate method to determine chloride ion concentration in water and in treated sewage effluents. The maximum allowable pH at which a 3.5 mg Cl/liter solution can be measured by the ion specific electrode method without appreciable error is 11.9; however, the pH of natural waters and most wastes waters is less than that value. When water is very high in ionic strength, the addition of an ionic strength adjusting solution is recommended. When this precautionary step is taken a correlation coefficient of 0.94 is obtained for data gathered by the two methods. The removal of sulfide ions was also recommended when using the ion specific electrode method. The precipitation method, using cadmium ions, was found to be most efficient because it was not time consuming and requires a minimum of sample handling. (Beale-FIRL)
W76-03234

DETERGENT PHOSPHATE BAN YIELDS LITTLE PHOSPHORUS REDUCTION, PART I,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
J. E. Etzel, and J. M. Bell.
Water and Sewage Works, Vol 122, No 9, p 91-93, September, 1975. 3 fig, 4 tab, 11 ref.

Descriptors: *Nutrient removal, *Phosphates, *Detergents, *Eutrophication, Water pollution effects, Pollutant identification, Analytical techniques, Legislation, Bioassay, Indiana, Sewage treatment, Waste disposal, Rivers.
Identifiers: Detergent phosphate ban.

A 1974 study was conducted on nutrient levels in Indiana streams and indicated that a January, 1973, legislative ban on detergent phosphates had not reduced stream phosphorus levels enough to prevent the acceleration of eutrophication. When the study was made, the ban on detergent phosphates had been in effect for over 18 months. The nutrient content of the surface waters was measured relative to generally accepted growth-limiting ranges. The presence or absence of growth limitation was established by a bioassay of algal growth potential of the surface waters; the presence or absence of surplus phosphorus in filamentous algae taken from the waters was also measured. The two Indiana river systems from which samples were taken were the Wabash and White River systems. Both are influenced by significant domestic waste water discharges. Results of chemical analyses, laboratory algal bioassay, and plant extraction procedures were displayed in several tables. Because of the detergent phosphate ban had not been successful in reducing the potential for algal growth, it was suggested that nutrient removal through flocculation at sewage treatment plants might be used to reduce the discharge of all nutrients. (Kramer-FIRL)
W76-03235

LANDSAT MEASURES OF WATER CLARITY,
General Electric Co., Beltsville, Md.
D. J. Brooks.
Photogrammetric Engineering and Remote Sensing, Vol 41, No 10, p 1269-1272, October, 1975. 2 fig, 9 ref.

Descriptors: Seston, Transmissivity, Reflectance, Water circulation, Turbidity, Tides, Suspended solids, Currents(Water), Satellites(Artificial), Monitoring, *Pollutant identification, *Potomac River, Virginia, Water quality, Remote sensing.
Identifiers: Gunston Cove(Va), LANDSAT, Water clarity, *Spectral measurements.

LANDSAT reflectance data are compared with in situ transmittance data as a measure of water clarity. Gunston Cove, Virginia, which empties into the Potamac River, was the area chosen for study because: it has an obvious horizontal seston/reflectivity gradient; two streams emptying into the cove and the river provide a continuous contribution of suspended solids; and currents effectively keep materials in suspension. Data were collected during two different times, one at ebb tide and the other during flood tide. In situ measurements were taken at 16 different stations in a straight line approaching the Potomac River. Measurements were taken over four discrete spectral intervals: 0.5 to 0.6 microns, 0.6 to 0.7 microns, 0.7 to 0.8 microns, and 0.8 to 1.1 microns, and at a depth of one half meter with a 10 cm pathlength. LANDSAT reflectance measurements were taken about two hours after the transmittance data were collected. Results showed that during ebb tide

transmittance decreased and reflectance increased on approaching the river, while during flood tide transmittance increased and reflectance decreased. Increasing turbidity presents an increasing reflective surface to incident solar radiation, thus making the inverse correlation logical. Although more testing is required under different conditions and over large areas before correlation between the two types of measurements can be proven, data collected so far indicate that LANDSAT reflectance measurements can be used to complement in situ transmittance measurements. (Pinto-FIRL)
W76-03237

A SURVEY OF THE HEAVY METAL AND INORGANIC CONTENT OF SEWAGE SLUDGES,
University College, Cardiff, (Wales). Dept. of Mineral Exploitation.
R. O. Williams.
Water Pollution Control, Vol 74, No 5, p 607-608, 1975. 6 tab, 2 ref.

Descriptors: *Sewage treatment, *Heavy metals, Metals, *Sludge, Treatment facilities, *Waste water treatment, Waste disposal, Analytical techniques, Zinc, Copper, Lead, Chromium, Nickel, Spectrophotometry, Sampling, *Pollutant identification, Sewage sludge.
Identifiers: Sludge analysis.

A survey was made of 182 sewage treatment plants in England and Wales to determine the inorganic and heavy metal content of sewage sludges prior to their disposal. Plants were categorized as rural, urban, or industrial according to their known industrial waste water intake and contributing populations. The metal content of these sludges was determined by wet chemical methods, using atomic absorption spectrophotometry after destruction of the organic material. Results of inorganic contents of all the sludge samples were summarized in several tables. Metal concentrations for copper, zinc, lead, chromium, and nickel were shown. While the recommended maximum concentration of zinc equivalent in a batch of sewage sludge that can safely be allowed at an application rate of 12.5 ton DS/ha is 0.75%, 33 of the works sampled had sludges with zinc levels exceeding 0.755%. (Kramer-FIRL)
W76-03238

STUDY OF COAGULATION OF WATER BY FLUOROMETRY (ETUDE DE LA COAGULATION DES EAUX PAR FLUOROMETRIE),
Laval Univ., Quebec. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-03239

MONITORING LAB GIVES CITY THE JUMP ON SAFE DRINKING WATER REGULATIONS,
Inglewood Water Dept., Calif.
For primary bibliographic entry see Field 5F.
W76-03240

LABORATORY STUDIES CONCERNING REMOBILIZATION OF PHOSPHATE FROM IRON PHOSPHATE BY COMPLEX AND PRECIPITATION REACTIONS (LABORUNTERSUCHUNGEN UEBER DIE REMOBILISIERUNG VON PHOSPHAT AUS EISENPHOSPHATE DURCH KOMPLEX-UND FAELLUNGSREAKTIONEN,
R. Wagner.
Vom Wasser, Vol 44, p 131-172, 1975. 25 fig, 3 tab, 35 ref.

Descriptors: *Phosphates, *Laboratory tests, *Aerobic conditions, *Anaerobic conditions, Chemical precipitation, Chelation, *Pollutant identification, Analytical techniques.
Identifiers: Remobilization, Iron phosphate.

Laboratory tests were conducted on the remobilization of phosphate from iron phosphate by complex and precipitation reactions. The possibility of phosphate fixation in aerobic and anaerobic environments by iron compounds was investigated. The preparation of precipitated iron phosphate compound, used for the remobilization tests, was described. In aerobic conditions, strong chelating agents, such as EDTA and NTA, were the most effective. Among the hydroxy carboxylic acids, only citric acid had a significant effect. In the presence of calcium ions, the remobilization power of amino polycarboxylic acids was considerably diminished. Under anaerobic conditions, the release of phosphate was controlled by the amount of sulfide ions present if sequestering agents are excluded. Calcium ions also counteracted the remobilization of phosphate from ferrous phosphate by sulfide ions. (Kramer-FIRL)
W76-03241

MUNICIPAL WASTEWATER PLANT PROBLEMS WITH CYANIDE EFFLUENT REGULATIONS,
Metropolitan Sanitary District of Greater Chicago, Ill. Industrial Waste Div.
For primary bibliographic entry see Field 5D.
W76-03247

DISTRIBUTION AND BIOMAGNIFICATION OF HEXACHLOROPHENE IN URBAN DRAINAGE AREAS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering; and North Carolina Univ., Chapel. Hill School of Public Health.
For primary bibliographic entry see Field 5B.
W76-03248

SPECTROPHOTOMETRIC DETERMINATION OF RUTHENIUM WITH 3- (2-PYRIDYL) -5, 6-DIPHENYL-1,2,4-TRIAZINE,
Texas Univ. at Austin. Dept. of Chemistry.
L. C. Kamra, and G. H. Ayres.
Analytica Chimica Acta. Vol 78, p 423-429, 1975, 3 fig, 2 tab, 9 ref.

Descriptors: *Heavy metals, *Ruthenium, *Spectrophotometry, *Analytical techniques, *Separation techniques, *Pollutant identification.
Identifiers: Elemental analysis, 3-(2-pyridyl)-5, 6-Diphenyl-1-2-4-triazine(PDT).

Ruthenium (II) reacts with 3-(2-pyridyl) -5, 6-diphenyl-1,2,4-triazine (PDT) in water alcohol solution at pH 5 to give a magentacolored cationic complex having an absorption peak at 485 nm. The color is fully developed by heating at 85C for 30 min. The system conforms to Beer's law; the optimal concentration range for measurement at 1.00-cm optical path is about 0.5-3.4 p.p.m. of ruthenium. The molar absorptivity is 21,000 l/mole-cm. The effects of reagent concentration, heating temperature and time, pH, and alcohol concentration have been studied; maximal absorbance for 2.0 p.p.m. ruthenium occurred with solutions of pH between 4.4 and 5.7, and up to 20% enthanol by volume. Common anions do not interfere. Separation from interfering cations is effected by distillation and recovery of ruthenium tetroxide. Spectrophotometric methods of continuous variations and of mole ratios, and elemental analysis of solid salts isolated from solution indicate a ruthenium-to-PDT stoichiometry of 1:2, the PDT acting as a tridentate ligand. No special precautions regarding time stability need to be taken. (Hoyle-Vanderbilt)
W76-03299

THE USE OF GEL FILTRATION IN THE STUDY OF METAL BINDING BY HUMIC ACIDS AND RELATED COMPOUNDS,
Liverpool Univ. (England). Dept. of Oceanography.
R. F. C. Mantoura, and J. P. Riley.
Analytica Chimica Acta, Vol 78, p 193-200, 1975. 5 fig, 1 tab, 19 ref.

Descriptors: *Heavy metals, *Fulvic acids, *Humic Acids, *Gels, Copper, Nickel, Zinc, Spectrophotometry, *Chromatography, analytical techniques, *Pollutant identification, Metals.
Identifiers: Stability constants, Metal binding, Buffer systems, Molecular binding sites.

A gel filtration technique is described for the study of the complexation of dissolved metals by humic acids and fulvic acids. Measurements can be made under realistic conditions simulating pH and free metal ion concentrations found in natural waters by using tris-(hydroxymethyl)-amino methane (TRIS) for the buffer system. The equilibrated acid sample, dissolved in TRIS buffer, is injected into the gel column previously equilibrated by passage of the metal-TRIS buffer. The metal buffer is passed through the column while the absorbance of the effluent from the column is monitored at a wavelength appropriate to the concentration of the sample acid expected in the effluent. Fractions are collected and analyzed for the appropriate metal ion by atomic absorption spectrometry or, alternatively, by a gamma-scintillation counter if a suitable gamma-emitting radioisotope is available. The procedure permits the determination not only of the overall stability constant, but of the binding stoichiometrics and the intrinsic stability constants associated with the various types of metal binding sites. The procedure has been applied to the investigation of the interaction of fresh-water fulvic acids with copper, zinc and nickel, and has provided evidence for the existence of two different types of binding sites in the fulvic acid molecule. (Hoyle-Vanderbilt)
W76-03301

EFFECT OF FALLOUT OF WINDBRONE ZINC, LEAD, COPPER AND CADMIUM FROM A FUMING KILN ON SOIL GEOCHEMICAL PROSPECTING AT BERG AUKAS, SOUTH WEST AFRICA,
Cape Town Univ., South Africa. Dept. of Geochemistry.
For primary bibliographic entry see Field 5B.
W76-03302

MAJOR AND TRACE ELEMENT ANOMALIES IN STREAM SEDIMENTS OF THE TEIGN VALLEY OREFIELD,
Southampton Univ. (England). Dept. of Geology.
J. R. Merefield.
Journal of Geochemical Exploration, Vol 3, No 2, p 151-166, May 1974, 1 tab, 5 fig, 33 ref.

Descriptors: *Trace elements, *Heavy metals, *Sedimentary basins(Geologic), Soil analysis, *Minerology, *Water analysis, Petrology, Pollutant identification.
Identifiers: Teign Valley(England).

A detailed geochemical and sedimentologic study of twenty-two bulk stream sediments from streams draining Dartmoor granite and Culm in the Teign Valley shows the influence of lithology, mineralization and contamination of such cumulative samples. K, Cu and Ni in stream sediments are potential indicators of lithology. Ba and Pb values, as well as barytes concentrations, demonstrate the contribution of Ba, Zn and Pb mineralodes, while Fe, S, and heavy-mineral percentages emphasize that of Fe lodes and contamination. Evidence shows Fe as a scavenger. High Mn values are attributed to precipitations of the metal derived largely from impregnations of the Culm. (Hoyle-Vanderbilt)
W76-03303

DETERMINATION OF SILVER IN BIOLOGICAL MATERIALS BY HIGH-FREQUENC

LASMA-TORCH EMISSION SPEC-ROMETRY,
overnment Industrial Research Inst., Nagoya apan).
. Nakashima, S. Sasaki, and S. Shibata.
nalytica Chimica Acta, Vol 77, p 65-70, 1975. 2 g, 3 tab, 14 ref.

escriptors: *Heavy metals, *Pollutant Identifica-on, *Spectrometers, *Analytical techniques, Trace elements, Chemical precipitation, hotometry, Chemistry, Instrumentation, Pollu-nts.
lentifiers: *Silver, High frequency plasma rches, Emission spectrometry, Biological sam-es, Whole blood analysis, Bismuth, Coprecipita-on, Emission intensity.

igh frequency plasma torches provide better eproducibility than conventional methods of ex-tation in emission spectrometry. They have uch higher temperatures than flames, and they an be applied to gaseous, liquid, and solid sam-es. Nanogram amounts of silver in small samples f biological materials can be determined by high-equency plasma-torch emission spectrometry. amples are digested with perchloric and nitric ids, silver is coprecipitated with bismuth iodide, nd the precipitate is decomposed with concen-ated nitric acid before dilution. Bismuth shows n enhancing effect on the silver emission at 28.06 nm, and the sensitivity is further improved y elimination of moisture in the aerosol with a econd condenser at -3 to -5 degrees C. The detec-on limit is 0.5 ng per 0.2 ml of sample solution. ondensed milk and whole blood were analyzed atisfactorily. (Davis-Vanderbilt)
/76-03304

N ELECTRON MICROSCOPE AUTORADIO-RAPHIC INVESTIGATION OF THE ACCU-IULATION OF ZINC-65 BY A SPECIES OF UTREPTIA,
delaide Univ., (Australia). Dept. of Botany.
. A. Sims.
xperientia, Vol 31, Fasc. 4, p 426-427, April 15, 975. 1 tab, 18 ref.

escriptors: *Heavy metals, *Zinc, Pollutants, Pollutant identification, *Absorption, licroogranisms, Electron microscopy, Zinc dioisotopes, Ecological distribution, Environ-ental effects, Biological membranes, Algae, oxins, Food chains, Australia.
lentifiers: Cell physiology, Autoradiography, utreptia, Chloroplasts, Port Pirie(South Aus-alia), Intracellular localization.

nalyses of marine plants and animals have shown at zinc is accumulated to levels up to one ousand times environmental levels. Eutreptia, a ngle celled marine organism, was studied using utoradiography to find where in the organism nc is accumulated and in what amounts. utreptia were isolated from samples of industrial ffluent and maintained in sterile seawater con-ining radioactive Zn65 for periods of 12 to 24 ours. The organisms were removed by filtration nd prepared for electron microscopy. The result-g autoradiographs were examined for developed rains over various organelles and the areas of ach organelle estimated. The results were nalyzed statistically to determine whether the mount of label over the organelles was propor-onal to their relative areas. Results show that the n65 was accumulated by the organisms and local-ed in the chloroplasts. (Davis-Vanderbilt)
/76-03308

ETERMINATION OF TUNGSTEN IN EOLOGIC MATERIALS BY NEUTRON AC-IVATION ANALYSIS,
eological Survey, College Park, Md.
. O. Simon, and C. L. Rollinson.
ournal of Research, United States Geological urvey, Vol 3, No 4, p 475-478, July-August, 1975. fig, 2 tab, 9 ref.

Descriptors: *Heavy metals, *Neutron activation analysis, *Pollutant identification, Geology, *Analytical techniques, Separation techniques, Chemical precipitation, Fused salts, Trace elements, Irradiation, Geochemistry, Rocks, Mineralogy.
Identifiers: *Tungsten, Gamma counting, Alpha-benzoinoxime, Half-life, Germanium detectors.

Normal semiquantitative spectrographic methods for measuring tungsten do not possess adequate sensitivity to determine tungsten in geologic materials. A neutron activation analysis technique for determining tungsten in small geological samples (about 100 mg) is discussed. The coefficients of variation for less than p.p.m. concentrations of tungsten are normally less than 20%. The limit of detection is 0.005 ppm. A sample to be analyzed is first irradiated for 1 hour in a thermal neutron flux in a reactor. It is allowed to decay for 24 hours, and 188W is added as a tracer. After fusion with sodium peroxide, tungsten is isolated by extraction into chloroform with alpha-benzoinoxime, back extraction into aqueous potassium hydroxide, and precipitation with alpha-benzoinoxime. The activities of the 0.13 and 0.48 MeV gamma rays are measured. The yield, normally 40 to 90%, is determined by measuring the activity of the 0.155 Mev gamma ray. (Davis-Vanderbilt)
W76-03309

MAGNETIC SUSCEPTIBILITY OF LAKE SEDIMENTS,
Edinburgh Univ., (Scotland). Dept. of Geophysics.
For primary bibliographic entry see Field 2J.
W76-03311

APPLICATION OF THE STAINTON SYRINGE METHOD TO THE ANALYSIS OF MERCURY IN NATURAL WATERS,
Fisheries and Marine Service, West Vancouver (Brittish Columbia). Pacific Environmental Inst.
J. A. J. Thompson, and F. T. McComas.
Environmental Letters, Vol 5, No 3, p 189-197, 1973, 1 fig, 1 tab, 12 ref.

Descriptors: *Heavy metals, *Pollutant identification, Saline water, *Estuarine environment, Analysis, Spectrophotometry, *Mercury.
Identifiers: *Atomic adsorption spectrophotometry, *Stainton adsorption cell, Solvent extraction, Cold-vapor.

A relatively inexpensive, simple and precise method for analyzing subnanogram quantities of mercury in fully saline and estuarine natural waters is described. Through a combination of a solvent extraction procedure and a 'cold-vapor' technique, standard deviations of plus or minus 0.0049 and plus or minus 0.0112 were obtained at mean mercury concentrations of 0.023 and 0.166 ng/ml respectively. The recoveries were 94%. Atomic adsorption spectrophotometry using a Stainton adsorption cell was used for the flameless mercury analysis. The method is ideally suited for routine mercury analysis at sub-nanogram levels. (Gregory-Vanderbilt)
W76-03313

GEOCHEMICAL AND BIOGEOCHEMICAL EXPLORATION RESEARCH NEAR EARLY PRECAMBRIAN PORPHYRY-TYPE MOLYBDENUM-COPPER MINERALIZATION, NORTHWESTERN ONTARIO, CANADA,
Ministry of Natural Resources, Toronto, Ontario, Canada. Ontario Division of Mines.
W. J. Wolfe.
Journal of Geochemical Exploration, Vol 3, No 1, p 25-41, March 1974. 8 fig, 2 tab, 16 ref.

Descriptors: *Geochemistry, *Minerology, *Copper, *Molybdenum, Heavy metals, Conifers, Vegetation effects, *Soil chemistry, Soil surveys, *Canada.
Identifiers: *Biogeochemistry, *Chemical dispersion, Ontario.

A preliminary assessment is presented of surface geochemical and biogeochemical exploration methods in an area of widespread, low-grade Precambrian molybdenite-pyrite-chalcopyrite mineralization complicated by the presence of extensive transported quaternary cover including variable thickness of boulder till and Late Pleistocene lake clay. Data are presented for the distribution of copper and molybdenum in bedrock, soils and vegetation. Discussion is offered about secondary chemical dispersion of copper and molybdenum, and copper and molybdenum uptake in coniferous vegetation. (Hoyle-Vanderbilt)
W76-03315

A STUDY OF THE ATOMIC ABSORPTION DETERMINATION OF SOME IMPORTANT HEAVY METALS IN FERTILIZERS AND DOMESTIC SEWAGE PLANT SLUDGES,
Toronto Univ., (Ontario). Dept. of Geology; and Toronto Univ., (Ontario). Dept. of Chemistry.
J. C. Van Loon, and J. Lichwa.
Environmental Letters, Vol 4, No 1, p 1-8, 1973. 4 tab, 2 ref.

Descriptors: *Heavy metals, *Pollutant identification, *Waste identification, *Sewage sludge, *Fertilizers, Chromium, Copper, Iron, Manganese, Cadmium, Lead, Nickel, Zinc.
Identifiers: *Atomic absorption, Rapid analysis, Sewage fertilizers.

An atomic absorption method was used to rapidly analyze sewage sludges and processed sewage fertilizers. Surprisingly high levels of heavy metals were found in some of the samples; of particular interest were cadmium, chromium, copper, lead, nickel, iron, zinc and manganese. With the exception of nickel, little problem was encountered with intermetal chemical interfences. The light metal ingredients in concentrated sample solutions frequently resulted in appreciable background adsorption, and correction lines were ascertained. The rapid procedure was found to be sufficient for most practical purposes. The sludge samples chosen represent vastly different sewage input patterns, and the measured metal was found to be proportional to the industrial use of the metal in the area. (Gregory-Vanderbilt)
W76-03316

MULTIELEMENT ANALYSIS OF SLUDGE SAMPLES BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
R. A. Nadkarni, and G. H. Morrison.
Environmental Letters, Vol 6, No 4, p 273-285, 1974. 3 tab, 9 ref.

Descriptors: *Heavy metals, *Sludge, *Pollutant identification, *Environmental effects, *Toxocity, Trace elements, Iron, Calcium, Copper, Aluminum, Chromium, *Neutron activation analysis, Mercury, Nickel, Vanadium, Rare earths.
Identifiers: *Screening, *Sludged soil.

A multielement survey measuring method using instrumental neutron activation analysis was developed to screen up to 40 trace elements in a variety of sludge samples, as well as in soils in which sludges had been incorporated. The elements determined included 10 major-minors, 10 rare earths, and 20 other trace elements. Included were elements essential to plant/animal life: manganese, sodium, potassium, calcium, iron, vanadium, copper, chromium, selenium, zinc, cobalt and magnesium, as well as elements of toxicological concern: aluminum, antimony, chromium, mercury, nickel, selenium, silver and barium. Samples analyzed included sludge collected from ten Indiana cities, and soil from a field in Columbus, Indiana, which had been treated with sludge. The composition of the sludges was found to vary greatly; the elements present at the highest levels were calcium, iron, aluminum, and mercury. Some sludges

were also rich in copper, chromium, and nickel. In the sludgemtreated soil, composition variation with depth was not very noticeable, and except for chromium, the concentrations increased from the surface to the deeper strata. Especially striking higher concentrations of vanadium , chromium, and nickel were measured. The study demonstrates the feasibility of using the instrumental neutron activation technique for large-scale routine analysis of sludges and soils. (Gregory-Vanderbilt)
W76-03319

TREES AS ENVIRONMENTAL SENSORS MONITORING LONG-TERM HEAVY METAL CONTAMINATION OF SPOKANE RIVER, IDAHO,
Washington State Univ., Pullman. Dept. of Chemical and Nuclear Engineering.
J. C. Sheppard, and W. H. Funk.
Environmental Science and Technology, Vol 9, No 7, p 638-642, July, 1975. 2 fig, 1 tab, 20 ref. OWRT B-044-WASH(4).

Descriptors: *Heavy metals, *Dendrochronology, Rivers, *Neutron activation analysis, *Ponderosa pine trees, Mining, Sediments, Cores, Mercury, Chromium, *Idaho, Zinc, Cobalt, Iron, *Pollutant identification.
Identifiers: *Environmental sensors, *Gamma-emitting radionuclides, Spokane River(Idaho), Coeur d'Alene Lake(Idaho), Post Falls(Idaho), Silver, Rhodium.

Ponderosa pine trees growing on the bank of the Spokane River, Idaho, were used to monitor the river's concentrations of Hg, Cr, Ag, Rb, Zn, Co, and Fe over the past 60-70 years. Using neutron activation analysis, sections of cores and tree rings were studied to determine the metal content as a function of tree ring age. Data were compared with sediment core data from Coeur d'Alene Lake and the dates of peak mining activity in the Coeur d'Alene mining district. Although this is a preliminary study, results indicate that long-lived trees growing in intimate contact with rivers may be used to monitor variations of metal ion concentrations in rivers for times approaching a century. Although the correlation between the tree and mining data is general, more specific analysis may be accomplished by incorporating originial heavy metal levels and river flow data into the study. (Davis-Vanderbilt)
W76-03320

OXYGEN TRANSFER IN FERMENTATION,
Iowa State Univ., Ames. Dept. of Chemical Engineering.
G. T. Tsao, and D. D. Lee.
AIChE Journal, Vol 21, No 5, p 979-985, September, 1975. 7 fig.

Descriptors: Analytical techniques, *Waste water treatment, *Mass transfer, *Oxygen, Air-water interfaces, Surfactants, Fermentation, Aerobic conditions, *Pollutant identification.
Identifiers: *Oxygen sensing microprobe, *Oxygen transfer, Danchkwerts theory.

An experimental investigation of interfacial resistance to oxygen transfer in biological processes was made, using an oxygen sensing microprobe. This instrument is an inert material coated long needle with an exposed sensing tip about 2 microns long and one micron wide, which can detect the local oxygen concentration and send signals to a picoammeter for readout and recording. The oxygen sensing microprobe was used in contaminated water to detect the existence of two transferring zones near a surfactant laden surface (the stagnant film zone and the penetrable zone) and to measure the frequency of surface renewal in clean water. A linear relationship was found between the square root of the renewal rate, 0.5, and the interfacial mass transfer coefficient, K sub L, which was predicted by the Danckwerts theory. Further work with the microprobe was recommended to allow direct experimental determination of the concentration profile of a transferring solute at a gas-liquid interface, and to provide information for further refinement of existing gas-liquid mass transfer theories. A clear understanding of the relationships involved in interfacial resistance to oxygen transfer is important because the rate of biological processes in aerobic fermentation and waste water treatment may be limited by them. (Beale-FIRL)
W76-03321

CORRELATION OF VARIOUS MONITORING ITEMS REGARDING POLLUTION SUBSTANCES OF HUMAN WASTES AND TREATED WATER (SHINYO TO SONO SHORISUI NO GDAKU SIBUN NI KANSURU KAKUSHU SOKUTEI KOMOKU KAN NO SOKAN Ni TSUITE),
T. Nagasawa, N. Tanaka, and T. Yashima.
Kyotofu Eisei Kenkyusho Nenpo, (Annual Report of Kyoto Prefectural Institute for Public Health), p 83-90, March, 1975. 6 fig, 3 tab, 6 ref.

Descriptors: *Pollutant identification, *Monitoring, *Water pollution control, *Sewage, *Waste water treatment, Oxidation, Biochemical oxygen demand, Ammonia, Sedimentation, Activated sludge.

Correlations among various measured items for water released from the second oxidation tank and overflow water from the final sedimentation tank of a total oxidation treatment method and for overflow water from the final sedimentation tank of a digestion activated sludge method were studied. The measured items included BOD, evaporation residue (ER), ignition loss (IL), COD(30-min), COD(4-hr), albuminoid N (Alb-N), ammonial N(Ammon-N), Alb-N+Ammon-N, iodine demand (ID) and chloride ion. Close correlations were found between the COD(4-hr), ER, IL and chloride ion of the released water from the second oxidation tank. Other items also showed noticeable correlations. Smaller amounts of correlation were found between the measured items for the overflow water from the final sedimentation tank of the total oxidation method, and better correlations were found for the overflow water from the final sedimentation tank of the digestion activated sludge method. (Su-FIRL)
W76-03342

METAL CONCENTRATIONS IN THE SEWAGE, EFFLUENTS, AND SLUDGES OF SOME SOUTHERN ONTARIO WASTEWATER TREATMENT PLANTS,
Canada Centre for Inland Waters, Burlington, Ontario.
B. G. Oliver, and E. G. Cosgrove.
Environmental Letters, Vol 9, No 1, p 75-90, 1975. 4 tab, 17 ref.

Descriptors: Effluents, *Sewage, *Sludge disposal, *Waste water treatment, *Metals, *Treatment facilities, Trickling filters, Aeration, *Pollutant identification, Sludge digestion, Anaerobic digestion, Sewage sludge, Sewage treatment, Land, Activated sludge, Sewage effluents, Spectroscopy, Chemical analysis, Biological treatment, Water pollution sources, Domestic wastes, Industrial wastes, Water pollution.
Identifiers: Removal efficiencies, Metal concentrations.

Removal efficiencies by biological treatment of metals in raw sewage, effluents and sludges are discussed in terms of the effects on receiving waters and agricultural lands. Samples were collected at treatment plants and dissolved in acid and analyzed spectroscopically in the laboratory. The types of treatment plants studied were the conventional activated sludge system, the extended aeration system and the trickling filter system. Studies showed that the highest metallic content came from industrial waste waters, and in many cases certain metals could be traced to specific plants. Metal removal efficiencies for activated sludge plants were high except for some metals such as bismuth, nickel and strontium. This was due to the fact that most metals come out of solution when mixed with domestic waste waters, with the exception of these three. An extended aeration system showed about the same metal removal efficiency as the activated sludge plants, but the trickling filter system was slightly less efficient. The metals removed by the sewage treatment processes are heavily concentrated in the sludge. Anaerobic digestion under high temperatures reduces the volume and increases the metallic concentration. When this sludge is returned to the land there could be a detrimental effect on crop growth over a period of years. Improved guidelines must be developed before land application of sewage sludge can become an acceptable practice. (Pinto-FIRL)
W76-03343

CONTAMINATION OF THE DANUBE IN BRATISLAVA BY SEWAGE 2ND COMMUNICATION (DIE SALMONELLA-VERUNREINIGUNG DER DONAU DURCH ABWASSER IN BRATISLAVA 2. MITTEILUNG),
O. Kadlecova.
Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Vol 130, No 2, p 144-150, 1975. 4 tab, 18 ref.

Descriptors: Analytical techniques, Rivers, *Waste disposal, *Sewerage, *Pathogenic bacteria, *Salmonella, Sewers, Public health, Water pollution sources, *Pollutant identification.
Identifiers: Bratislava, *Danube River.

Samples were taken once per month for a one-year period to determine the occurrence of Salmonella in the main sewer of the city of Bratislava and in the Danube river 50, 100, and 200 meters below its outfall. The presence of Salmonella was analyzed in the 0.1, 1, 10, 50, 100, and 200 ml depths. In the 0.1 ml and one ml samples of the Danube water at all three distances below the outfall of sewage Salmonella was detected. There were no seasonal differences found in the occurrence of pathogenic bacteria. Several tables illustrate the 623 strains of Salmonella that were isolated. These belonged to 6 serological groups, including 34 sero and lysotypes. The most frequent types found were S. paratyphi B, S. bareilly, S. typhi-murium, and S. anatum. The frequency of occurrence of Salmonella in the water samples was compared with their occurrence in humans and animals in the Bratislava area, and significantly more serological types were found in the water samples. (Kramer-FIRL)
W76-03344

A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER,
California State Univ., Chico.
For primary bibliographic entry see Field 5B.
W76-03358

MONITORING AGRICULTURAL POLLUTION USING NATURAL FLUORESCENCE,
Saskatchewan Research Council, Saskatoon.
G. Lakshman.
Water Resources Research, Vol 11, No 5, p 705-708, October 1975. 9 fig, 1 tab, 7 ref.

Descriptors: *Monitoring, *Fluorescence, Analytical techniques, *Agricultural runoff, *Farm wastes, *Water pollution, Data collections, Measurement, Data transmission, Indicators, Pollutants, Water quality, *Pollutant identification, Fluorometry, Surface runoff, Organic compounds, Organic wastes, Nutrients, Sampling, Feed lots.

entifiers: *Agricultural pollution, Bio-organic mpounds, Soil samples, Runoff samples, Total rbon, Total organic carbon, Quantitative mea-rement, Luminescence, Turner fluorometer, edlot wastes, Mobile laboratory.

ny organic and bio-organic compounds exhibit tural fluorescence in the visible spectrum. In ny cases this is strong enough to be used as a hnique to monitor the presence of pollutants m animal wastes on land and in water. A mber of soil and runoff samples from feedlot es have been analyzed for the nature and stabili- of their natural fluorescence. A strong correla- n exists between the fluorescence emission and water quality parameters such as total carbon C), total organic carbon (TOC), and total inor- nic carbon (TIC). It can be used in the quantita- e measurement of agricultural pollution, and fu- re research should help to exploit the technique r remote sensing applications. (Henley-ISWS) 76-03387

DEX OF SURFACE WATER QUALITY ECORDS TO SEPTEMBER 30, 1973, OUTHEAST ALASKA,
eological Survey, Anchorage, Alaska.
r primary bibliographic entry see Field 7C.
76-03400

HE EXTRACTION OF OSMIUM WITH RIBUTYL PHOSPHATE AND PHOTOMETRIC ETERMINATION WITH THIOUREA,
dian Inst. of Tech., Bombay. Dept. of Chemis-y.
Kalyanaraman, and S. M. Khopkar.
nalytica Chimica Acta, Vol 78, p 231-233, 1975. 1 b.

escriptors: *Heavy metals, *Photometry, Analytical techniques, *Pollutant identification, eparation techniques, Phosphates.
entifiers: *Osmium, Platinum group elements, ributyl phosphate, Thiourea.

his method allows a quantitative separation of mium from some platinum group elements. smium is extracted with tributyl phosphate BP) from 1-2M hydrochloric acid and deter- ined photometrically as its complex with thiou- a at 480 nm. Beer's law was obeyed over the ncentration range 5-48 micrograms osmium per l at 480 or 540 nm, the latter wavelength provid- g lower sensitivity. The molar absorptivity was 800 at 480 nm on the basis of osmium content. uantitative extraction of osmium was possible nly from 1-2M hydrochloric acid with 100% TBP. he concentration of the thiourea solution dequate for full color development was 1 ml of queous 5% thiourea solution in a total volume of ml, which was then heated at 60C for 10 inutes to complete the color development. It is so possible to separate osmium from rhodium, idium, and platinum, and to analyze binary and ternary mixtures by this method. (Hoyle-Van-rbilt)
76-03408

NALYSIS OF FEED GRAINS AND FORAGES OR TRACES OF COBALT BY FLAMELESS TOMIC ABSORPTION SPECTROSCOPY,
ontana Dept. of Agriculture, Bozeman. Feed nd Fertilizer Div.
. Hageman, L. Torma, and B. E. Ginther.
ournal of the AOAC, Vol 58, No 5, p 990-994, eptember, 1975, 3 tab, 10 ref.

escriptors: Analytical techniques, *Heavy etals, *Cobalt, Plant tissues, Feeds, *Pollutant entification, Spectroscopy, *Separation chniques.
dentifiers: *Atomic absorption spectroscopy.

lameless atomic absorption spectroscopy (AAS) as been used for the analysis of cobalt (5-200 ppb) in plant material. An ashing temperature greater than 500 deg C causes some cobalt to be lost, and direct methods using the carbon rod atomizer were unsuccessful. Ca, Fe, Mg, and Mn can cause interference. An extraction technique using 1-nitroso-2-napthol as a chelating agent is recommended. Samples are dry ashed, dissolved in dilute HCl, and extracted with 1-nitroso-2-naphthol-chloroform, and the cobalt level is determined by AAS. (Hoyle-Vanderbilt)
W76-03410

FE-MN OXIDE COATINGS IN STREAM SEDIMENT GEOCHEMICAL SURVEYS,
Georgia Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-03412

THE EFFECTS OF DESALINATION BRINES ON CRASSOSTREA VIRGINICA (GMELIN),
Dow Chemical Co., Freeport, Tex. Texas Div.
For primary bibliographic entry see Field 5C.
W76-03414

NEW ENVIRONMENTAL HEALTH PROBLEMS IN WATER SUPPLY,
National Inst. of Environmental Health Services, Research Triangle Park, N.C.
For primary bibliographic entry see Field 5F.
W76-03425

CONTAMINANTS IN RAINWATER AND THEIR RELATION TO WATER QUALITY, PART II,
Suffolk County Dept. of Environmental Control, N. Y.
J. A. Frizzola, and J. H. Baier.
Water and Sewage Works, Vol 122, No 9, p 94-95, September, 1975. 1 fig, 1 tab, 15 ref.

Descriptors: *Water quality, *Groundwater, Precipitation(Atmospheric), Ions, Hydrogen ion concentration, Ammonia, Chlorides, Sulfur compounds, Water pollution.
Identifiers: *Groundwater contamination, Total acid effect(TAE), Scavenging acid effect(SAE).

Contaminants of rainwater are shown to have an effect on groundwater quality, by analysis of data collected at 3 stations on Long Island, New York. Background concentrations of 2 mg/liter total nitrogen enter groundwater as precipitation. Thus, when comparable concentrations are found in shallow groundwater they cannot be attributed to human pollution. Average values of ammonia concentration fit in with values from previous analyses in the northeastern United States. Ammonia can act to reduce acidity in rainwater, but since pH values of 4 or 5 are common, it seems the ammonia is either removed or dominated by stronger acid reactions. Sulfur compounds, especially sulfur dioxide formed from fossil fuel combustion, were found to be the predominant cause of acid precipitation over Long Island. Chloride/sodium ratios were less than the expected seawater values, perhaps as a result of the composite collection method. It is suggested that the term total acid effect (TAE) be used when discussing the composite sample and that scavenging acid effect (SAE) to be used to refer to pH obtained directly from natural precipitation. In this study, all ion concentrations in precipitation were reported higher at urban than at rural stations. (Beale-FIRL)
W76-03445

SIMULATION OF BOD AND DO BALANCE WITH RESPECT TO POLLUTED SHALLOW-RIVER (PART 2): SIMULATION EXAMPLE FOR MIDDLE COURSE TAMAGAWA (ASAI ODAKU KASEN NI OKERU BOD, DO SHUSHI NO SIMURASHON (DAI 2 HO): TAMAGAWA CHURYUIKI E NO TEKIYO REI),
For primary bibliographic entry see Field 5B.
W76-03446

A WATER CONDUCTIVITY RECORDER,
Commonwealth Scientific and Industrial Research Organization, Clayton (Australia). Div. of Chemical Physics.
G. F. Box, I. R. Dick, and P. D. Haines.
Australian Journal of Instrumentation and Control, Vol 31, No 4, p 67-72, July/August, 1975. 4 fig, 3 ref.

Descriptors: *Electrical conductance, *Monitoring, *Water quality, *Dissolved solids, Measurement, Instrumentation, Logging(Recording), Salinity, Surface waters, On-site tests, *Pollutant identification.

The design and development of an electronic instrument for measuring and recording the conductivity of surface waters is described. The instrument is designed for unattended field operation and is totally immersed in the water under test. A quartz-crystal-controlled solid state clock defines the sampling period, while a thermal printer records the measured conductivity values. A cast-aluminum housing contains the electronics with an inductive-type sensing head mounted below, inside a louvred plastic screen. The instrument has a temperature-compensated conductivity range of 0 - 17,600 microSiemen per cm with a resolution of 0.5% and a linearity of 1.0% of full scale. It has an unattended operating period of at least three months when sampling at a 12-hourly rate. (CSIRO)
W76-03453

INDUSTRIAL REQUIREMENTS FOR EFFECTIVE POLLUTION CONTROL. AUTOMOBILE INDUSTRY,
General Motors Corp., Warren, Mich. Environmental Activities Staff.
For primary bibliographic entry see Field 5G.
W76-03498

ION-SELECTIVE ELECTRODES IN ENVIRONMENTAL RESEARCH,
Missouri Univ., Columbia. Dept. of Chemistry.
S. E. Manahan, M. J. Smith, and K. M. Stelting.
In: Electrochemical Contributions to Environmental Protection, Theodore R. Beck, et al, editors. The Electrochemical Society, Inc., Princeton, New Jersey, 1972, p 50-56. 2 ref. OWRR A-049-MO(7).

Descriptors: *Ion exchange, *Electrodes, *Analytical techniques, Calcium, Fluorides, Nitrates, Sulfates, Monitoring, Copper, Monitoring, Copper, Chelation, Denitrification, Ammonia, Biodegradation, Metals, Enzymes, Electrochemistry, Pollutants, Cations, Water properties, Algae, Waste water treatment, *Pollutant identification.
Identifiers: *Ion-selective electrodes.

The two types of specific-ion electrodes --the liquid ion exchanger type such as calcium electrodes and the solid membrane such as the fluoride type-- can be used to determine fluoride, perchlorate, nitrate, sulfate, and EDTA. They are not interference-free specific sensors for analysis and monitoring pollutants in natural and waste waters, but can be used for fundamental studies of natural water. They respond to ion activities, not total concentrations, provide continuous monitoring, do not require sample treatment, can frequently be used in situ, and respond to species for which other sensors are unavailable. Nitrate electrodes can follow nitrate reactions in bacterial media but nitrate and Chlorella cells interfere. Copper electrodes can determine copper requirements for Oocystis, monitor copper removal, and should be applicable to complexation studies in natural and waste waters. It should be possible to use ion-selective electrodes to determine chelating agent strength, nitrate electrodes to study denitrification processes where nitrogen is produced from nitrate reduction in tertiary waste water treatment; ammonia electrodes to study decomposition of nitrogenous wastes to produce

ammonia; copper and cadmium electrodes to study biodegradation of chelates of these metals; and enzyme electrodes to study biologically active compounds in waste waters. (Buchanan-Davidson--Wisconsin)
W76-03499

THE APPLICATION OF SEMICONDUCTOR COMPOUNDS AS INDICATOR ELECTRODES,
Skopje Univ. (Yugoslavia). Center for Radioisotopes Application in Science and Industry.
P. Kirkov.
In: Electrochemical Contributions to Environmental Protection, Theodore R. Beck, et al., editors. The Electrochemical Society, Inc., Princeton, New Jersey, 1972, p 57-75. 9 fig, 60 ref.

Descriptors: *Electrical properties, *Electrodes, *Indicators, *Analytical techniques, Ions, Conductivity, Electrolytes, Aqueous solutions, Heavy metals, Potentiometers, Electrochemistry, *Pollutant identification.
Identifiers: *Semiconductor compounds, *Ion-selective electrodes.

Adequate conductivity is a serious problem in solid-type ion-selective electrode preparation. Impurities and degree of nonstoichiometry influence ion-selective electrode conductivity, independent of preparation method. Solid ion-selective electrodes are semiconductors or show semiconductor properties. Semiconductor compounds might be used as indicator electrodes for potentiometric determination of ion concentrations. Theory and applications of non-stoichiometrical oxide semiconductive compounds, used as indicator electrodes in electroanalytical measurements for simultaneous determination of mixed electrolyte concentrations in aqueous and non aqueous solutions, are discussed. The relation between concentrations of several single electrolytes and steady state potential of semiconductor oxides was derived from a boundary layer structure model with double layers on the solution and semiconductor sides. This was experimentally verified in aqueous solutions of heavy metals, carbon monoxide, carbon dioxide, sulfur dioxide, sulfur trioxide, halides, chromates, and phenol. Any semiconductor electrodes on whose surface there is favorable ion adsorption (especially n-type nonstoichiometric oxide semi-conductors) might be used for potentiometric measurements of ion concentration. A tin oxide and indium oxide n-type semiconductor electrode was used to determine ion concentration and surface active materials. (Buchanan-Davidson--Wisconsin)
W76-03500

5B. Sources Of Pollution

WATER QUALITY IN IOWA STREAMS: SUMMARY OF A CONFERENCE HELD MARCH 1975.
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5A.
W76-03004

CADMIUM IN PLANKTON: ELEVATED CONCENTRATIONS OFF BAJA CALIFORNIA,
Moss Landing Marine Labs., Calif.
J. H. Martin, and W. W. Broenkow.
Science, Vol. 190, No. 4217, p 884-885, November 1975. 2 fig, 10 ref.

Descriptors: *Plankton, *Metals, *Cadmium, Zooplankton, Detritus, Path of Pollutants, Sampling, Water pollution sources, Distribution patterns.
Identifiers: *Bioaccumulation, Baja California.

One hundred thirty-five plankton samples were collected in the northeast Pacific Ocean and analyzed for their cadmium content. Concentrations were generally low (2'to 5 micrograms of cadmium per gram, dry weight) in all samples, except for the plankton collected off Baja California, where high values (10 to 20 parts per million) were consistently found on two cruises. (Klein)
W76-03021

IMPACT OF SEWAGE ON THE DISTRIBUTION, ABUNDANCE AND COMMUNITY STRUCTURE OF ROCKY INTERTIDAL MACROORGANISMS,
California Univ., Irvine. Dept. of Population and Environmental Biology.
For primary bibliographic entry see Field 5C.
W76-03023

CADMIUM IN NEW ZEALAND DREDGE OYSTERS: GEOGRAPHIC DISTRIBUTION,
Marine Dept., Wellington (New Zealand). Fisheries Research Div.
S. A. Nielsen.
International Journal of Environmental Analytical Chemistry, Vol 4, p 1-7, 1975. 4 fig, 2 tab, 11 ref.

Descriptors: *Cadmium, *Mollusks, *Oysters, Metals, Geographical regions, *Distribution patterns, Water pollution sources.
Identifiers: *Ostrea lutaria, *Geographic distribution, Bioaccumulation, Tissue analysis, *New Zealand(Foveaux Strait).

High cadmium levels of up to 9 ppm wet weight were found in the dredge osyter, Ostrea lutaria, from Foveaux Strait, New Zealand. Average Cd levels in the oysters were determined at 24 stations to determine the geographic distribution of Cd. These data, in combination with a consideration of the prevailing currents, indicated that the Cd source lay in an area of no industrial pollution. Compared with other oyster species, O. lutaria was thought to have a predilection for accumulating Cd. (Klein)
W76-03025

FOULING COMMUNITY CHANGES INDUCED BY THE THERMAL DISCHARGE OF A HAWAIIAN POWER PLANT,
Hawaiian Electric Co., Inc., Honolulu. Environmental Dept.
For primary bibliographic entry see Field 5C.
W76-03028

ACUTE EFFECTS OF METHYL MERCURY TOXICITY IN CHANNEL CATFISH (ICTALURUS PUNCTATUS) KIDNEY,
Mississippi Univ., Jackson. Dept. of Anatomy.
For primary bibliographic entry see Field 5C.
W76-03044

SOME METHODOLOGY FOR APPRAISING CONTAMINANTS IN AQUATIC SYSTEMS,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
L. L. Eberhardt.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1852-1859, 1975. 3 fig, 2 tab, 37 ref.

Descriptors: *Methodology, Technology, *Laboratory tests, Design, Toxicity, Wastes, DDT, Dieldrin, Toxins, Absorption, Retention, Equations, Kinetics, Model studies.
Identifiers: *Kinetic models, Bioaccumulation.

Kinetic models for uptake and retention of various contaminants by aquatic biota were recommended as useful means of summarizing and intercomparing laboratory studies, and as essential tools in analyzing field data. Some simple models were fitted to laboratory data on the uptake and retention of DDT and dieldrin by fish. The relation between metabolic rate and body size was used to appraise data and concentrations of DDT, PCB's and mercury in fish. Evidence suggested that uptake and retention experiments performed on small fish gave very different results from those expected on individuals important in sports or commercial fisheries. (Klein)
W76-03048

STUDIES OF TOLERANCE TO HEAVY METALS IN THE FLORA OF THE RIVERS YSTWYTH AND CLARACH, WALES,
University Coll. of Wales, Aberystwyth. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5C.
W76-03053

EFFECT OF SOUTH LOUISIANA CRUDE OIL AND NO. 2 FUEL OIL ON GROWTH OF HETEROTROPHIC MICROORGANISMS, INCLUDING PROTEOLYTIC, LIPOLYTIC, CHITINOLYTIC AND CELLULOLYTIC BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-03054

A STUDY OF THE INTERTIDAL MACROFAUNA AROUND THE BP REFINERY (KENT) LIMITED,
City of London Polytechnic (England). Dept. of Biological Sciences; and Sir John Cass Coll., London (England). School of Science and Technology.
J. R. Wharfe.
Environmental Pollution, Vol 9, p 1-12, 1975. 7 fig, 3 tab, 14 ref.

Descriptors: *Speciation, *Seasonal, *Wildlife, *Mud flats, Intertidal areas, Annelids, Bivalves, Sampling, Oil, Water quality, Sediments, Water pollution sources, Estuaries.
Identifiers: Nereis diversicolor, Peloscolex benedeni, Petroleum refineries, England, Medway estuary.

A study of the species composition and seasonal quantitative estimates of the mud flat fauna of the lower Medway estuary revealed the complete absence of bivalves and a reduction in the number of annelids, particularly Nereis diversicolor and the tubificid Peloscolex benedeni, around the foreshore of the BP Refinery (Kent) Limited. Cores taken for particle size analysis, oil content, organic matter, redox potentials and free sulphide ion levels showed the extent of the effects to be restricted to an area approximately 1 1/2 km in either direction from the refinery outfall. Possible causes of the effects shown were discussed. (Klein)
W76-03055

A LABORATORY INVESTIGATION OF THE EFFECT OF SURFACE FILMS ON WIND INDUCED REAERATION,
Massachusetts Univ., Amherst. Water Resources Research Center.
D. C. Knudson, and P. A. Mangarella.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 462, $5.50 in paper copy, $2.25 in microfiche. Pub No 54, August 1975. Completion Report FY-76-1, 99 p, 27 fig, 60 ref, 2 append. OWRT A-056-MASS (1). 14-31-0001-4021.

Descriptors: *Reaeration, Thin films, Wind velocity, Measurement, Dissolved oxygen, *Regression analysis, Surfactants, *Electrolysis.
Identifiers: *Surface films, *Electorly tie reduction.

The effect of surface films on wind induced atmospheric reaeration of standing water was studied in a series of laboratory experiments. Measurements were made of reaeration into a small pool of water recessed into the floor of a wind tun-

at wind speeds from 3.8 m/s to 7.2 m/s, with
l without a soluble surfactant in the water. An
usual measurement technique was employed
ich involved the unsteady state electrolytic
uction of dissolved oxygen at a silver cathode
nersed in the water, and a regression analysis
the current-time data to obtain the reaeration
fficient, K.L
6-03100

NUMERICAL MODEL OF DROPLET EN-
AINMENT FROM A CONTAINED OIL
ICK,
unt Auburn Research Associates, Inc., Newton
per Falls, Mass.
G. Zalosh.
ailable from the National Technical Informa-
n Service as AD-A006 600, 5.00 in paper copy,
25 in microfiche. Report No CG-D-65-75, Sep-
nber 1974. 76 p, 14 fig, 16 ref, 3 append. DOT-
-41822-A.

scriptors: *Oil spills, *Oil pollution, *Water
lution, Water pollution control, Oil, Oily water,
chanical properties, Hydraulics, Model stu-
s, Mathematical models, Currents(Water),
ves(Water), Drops(Fluids), Entrainment, Com-
er programs.

theoretical analysis of oil droplet entrainment
m a contained oil slick moving relative to water
s been performed as a function of relative oil-
ter velocity. A numerical method incorporating
crete vortices was used to calculate smooth sta-
headwave profiles at low velocities and unsta-
profiles at high velocities. An oil droplet for-
tion criterion was formulated and applied to the
merically modeled headwave region. The com-
ted critical velocity corresponding to the onset
significant droplet entrainment was in close
reement with recent laboratory measurements.
e cmputed entrainment rates were in approxi-
te agreement with experiment, but did not ex-
it systematic variation with water current. Oil
op trajectories were calculated using realistic
rting conditions, but the work did not extend
yond the first intersection of the drop with the
ck. Recommendations were given for extending
work to include: post-information droplet
namics, wave effects, turbulence effects, and
rrier design changes. Computer program listings
re contained in an appendix. (Sims-ISWS)
6-03102

VIRONMENTAL STATUS OF THE LAKE
CHIGAN REGION, VOLUME 2. PHYSICAL
MNOLOGY OF LAKE MICHIGAN.
r primary bibliographic entry see Field 2H.
6-03105

RT 2. DIFFUSION AND DISPERSION,
ods Hole Oceanographic Institution, Mass.
T. Csanady.
vironmental Status of the Lake Michigan Re-
n, Volume 2. Physical Limnology of Lake
chigan, Report No ANL/ES-40, Volume 2, Ar-
nne National Laboratory, Illinois, p 103-121,
e 1975. 8 fig, 10 ref.

scriptors: *Lake Michigan, *Dispersion,
iffusion, *Disposal, Pollutants, Water pollu-
n, Circulation, Water circulation, Cur-
nts(Water), *Path of pollutants, Stochastic
ocesses, Mixing, Lakes.

e local concentration of a conservative pollu-
nt in Lake Michigan depends on the rate at
ich some discharged batch mixes with ambient
ters and thereby expands in size. The physical
chanism of such growth of pollutant-batches
s discussed in terms of several theoretical
odels which have appeared in the literature over
years, in order to throw light on the important
ocesses involved in pollutant disposal. Simple
ans of estimating pollutant concentration were
then briefly described, to allow the assessment of nuisance or hazard associated with the release of pollutants in the lake. (See also W76-03105) (Sims-ISWS)
W76-03107

SEASONAL CHARACTERISTICS OF WATER MASSES IN MUIR INLET, A FJORD WITH TIDEWATER GLACIERS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W76-03112

DETERMINING OPTIMAL WELL DISCHARGE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4B.
W76-03118

FLUOMETURON AND WATER CONTENT DISTRIBUTIONS DURING INFILTRATION: MEASURED AND CALCULATED,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
A. L. Wood, and J. M. Davidson.
Soil Science Society of America Proceedings, Vol 39, No 5, p 820-825, September-October 1975. 7 fig, 1 tab, 20 ref. EPA R-800364.

Descriptors: *Path of pollutants, Pollutant identification, *Adsorption, *Herbicides, *Dispersion, *Infiltration, Laboratory tests, Numerical analysis, Soil moisture.
Identifiers: *Fluometuron, *Adsorption-desorption, Miscible, Displacement, Water content, Cobb sand, Boundary conditions, Numerical dispersion.

Laboratory columns of Cobb sand were used to study the movement and distribution of surface applied 1,1-dimethyl-3-(a,a,a,-trifluoro-m-tolyl) urea (fluometuron) for three infiltration rates and two initial soil-water contents. Fluometuron movement showed little dependence on initial soil-water content for a given infiltration rate. Experimental data indicated that equilibrium existed between the adsorbed and solution phases for all infiltration rates and initial soil water contents studied with the exception of the ponded infiltration into air-dry soil case. A simultaneous numerical solution of the water and solute transport equations described a fluometuron pulse, for large infiltration rates, which lagged the experimental data. The agreement between calculated and measured distributions was improved when the infiltration rate was reduced. The shape of the fluometuron pulse was reasonably well described by the mathematical model. (Roberts-ISWS)
W76-03123

APPLICATION OF THE WIND EROSION EQUATION IN AIR POLLUTION SURVEYS,
For primary bibliographic entry see Field 5A.
W76-03125

WATER QUALITY IN A TROPICAL RAIN FORESTED CATCHMENT,
University of New England, Armidale (Australia). Dept. of Geography.
N. D. Turvey.
Journal of Hydrology, Vol 27, No 1/2, p 111-125, October 1975. 4 fig, 7 tab, 34 ref.

Descriptors: *Water quality, *Tropical regions, *Rain forests, *Dissolved solids, *Suspended solids, *Discharge(Water), Watersheds(Basins), Model studies, Calcium, Sodium, Potassium, Magnesium, Silica, Water pollution.
Identifiers: *Papua New Guinea, *Mass balance equation, *Mixing model, Bristol gage, Silicon dioxide.

Examined were the variations of Ca, Na, K, Mg, SiO2, dissolved-solids, and suspended-solids concentrations with discharge in a small rain-forested catchment in Central Papua. The mass-balance approach to mixing models was examined and it was considered that this can be used to predict water-quality variability, but it does not necessarily provide a mathematical explanation of the dilution process. Log-log and semi-log transformations of the data provided correlations close to those of the mixing model. The results obtained indicate a need for more water-quality data for areas of tropical rain forest which are to be developed, because this information can be related to catchment disturbance and used as a measure of nutrient loss from the ecosystem. Comparisons were made with other tropical and extra-tropical water-quality data. (Lardner-ISWS)
W76-03132

MOVEMENT OF HERBICIDES IN SOIL BY MASS FLOW,
Iowa State Water Resources Research Inst., Ames.
H. P. Johnson, and J. L. Baker.
Available from the National Technical Information Service, Sringfield, Va 22161 as PB-248 455, $4.00 in paper copy, $2.25 in microfiche. Completion Report, Iowa State Water Resources Research Institute No 66, June 1975. 35 p, 5 fig, 6 tab, 23 ref, 1 append. OWRT A-043-IA(1). 14-31-0001-3515/3815/4015.

Descriptors: *Path of pollutants, Pollutant identification, *Herbicides, Movement, *Soil types, *Unsaturated flow, *Mathematical models, Temperature, Soil density, Diffusion, Gas chromatography, Chemical properties, Physical properties, Iowa.
Identifiers: *Mass flow, Alachlor, Atrazine, Cyanazine, Percent moisture differences, Diffusion coefficient, Multiple linear regression, Diffusion cells.

The dominant factors in the movement of selected herbicides in soil by mass flow under unsaturated conditions are temperature, percent moisture differences, soil type, and at higher temperatures, soil density. Both increasing temperature and increasing moisture differences increased movement by what was believed to be mass flow. Soil type, by affecting the degree of herbicide adsorption, affected movement by mass flow. The higher porosity at lower density and thus greater vapor phase movement is believed responsible for higher diffusion coefficients for 0 and +12% differences at 43.3 degrees. The time of diffusion had no measurable effect on the rate of movement. Of the three herbicides studied at 1.3 gm/cc bulk soil density, only the diffusion rate for alachlor was measurably affected by the simultaneous movement of water. For both atrazine and cyanazine, movement was moisture independent. At 0.9 gm/cc the diffusion rate for alachlor, and at 43.3 C, for atrazine, was affected by the simultaneous movement of water. No measurements were made of cyanazine at 0.9 gm/cc. Because the data did not indicate that Fick's law was violated, an equation presented by Crank (1956) can be used to predict the movement in soil of the herbicides studied. This equation is based on the diffusion coefficient, D, which was shown in this study to be a function of temperature and moisture differences. in order to obtain D over a range of values for these variables, a multiple regression analysis was performed and regression coefficients determined.
W76-03134

UNCONVENTIONAL NUCLEAR POWER PLANT SITING OPTIONS AND WATER RESOURCE IMPACTS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W76-03135

PHENOLS IN THE CLARK FORK RIVER,
Montana Univ., Missoula. Dept. of Chemistry.
R. E. Erickson, C. Bardwell, and J. Sosebee.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 673, $3.50 in paper copy, $2.25 in microfiche. Research Report No 71, Montana University Joint Water Resources Research Center, Bozeman, September 1975. 11 p, 1 fig, 8 ref. OWRT A-082-MONT(1).

Descriptors: *Phenols, *Organic compounds, *Industrial wastes, Water chemistry, *Water quality, Effluents, *Montana, *Path of pollutants, Water pollution sources, Pollutant identification.
Identifiers: *Clark Fork River(Mont), Fish quality.

The objective was to determine the nature and amounts of phenols in the Clark Fork River. These compounds, which are a natural part of the effluent of Kraft pulp mills and are discharged every Spring into the Clark Fork, are known to be toxic of high concentrations to some species and to impair the flavor of fish at very low concentrations. The standard method for determining phenols was likely to be unsuitable for determining the type of phenols found in pulp mill effluent. An added objective was, therefore, to compare the standard method with a more sophisticated gas chromatographic technique for the analysis of phenols. The effluent from the Hoernor Waldorf mill contains a number of phenolic compounds. Gas chromatographic separation of a concentrated solution (5% carbowax 20 M TPA on Gas Chrom Q100/120 column) followed by mass spectroscopy revealed seventeen different compounds in the phenolic fraction, only two of which, p-cresol and propyl phenol were positively indentified. p-Cresol was found to be in the largest single concentration (37% of the phenolic fraction). The mill is now using secondary treatment on their effluent, which should lower their phenolic content (effluent in settling ponds contained 360 ppb phenols by the Standard Methods analysis in December, 1973). However, some caution must be exercised because two other factors--frequent shutdowns of the plant during 1975 and relatively high flow of the Clark Fork throughout the year--would tend to lower the concentration of phenolic compounds in the river.
W76-03136

CONTROL OF NITROGEN TRANSFORMATIONS IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
L. G. Bundy.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 730, $5.00 in paper copy, $2.25 in microfiche. Ph D Dissertation, 1973. 76 p, 3 fig, 17 tab, 41 ref. OWRT A-041-IA(2).

Descriptors: *Nitrogen, *Soils, *Fertilizers, Nitrification, Hydrolysis, Nitrogen compounds, Ureas, Inhibitors, Inhibition, Water pollution control, Water pollution sources, Chemistry, Soil chemistry.
Identifiers: *Nitrogen transformations.

Compounds that can effectively retard nitrification and urea hydrolysis in soils are clearly desirable because nitrate formed by nitrification of nitrogen fertilizers applied to soils undoubtedly contributes to nitrate pollution of water resources, and most of the problems associated with the use of urea as a fertilizer result from the rapid hydrolysis of urea by soil urease. The effectiveness of the nitrification inhibitors studied was markedly affected by soil type, soil temperature, and substitution of urea for ammonium sulfate as the source of nitrifiable nitrogen. Most of the inhibitors were considerably more effective at 15C than at 30C. Studies of the effects of three patented nitrification inhibitors (N-Serve, ATC, and CL-1580) on transformations of urea N in soils showed that these compounds had little, if any, effect on urea hydrolysis but greatly retarded nitrification of the ammonium formed by urea hydrolysis and markedly increased gaseous loss of urea N as ammonia. Studies of the effects of 10 urease inhibitors on nitrification of ammonium in soils showed that most of these inhibitors had little effect on nitrification when applied at the rate of 10 microgram/g of soil. (Sims-ISWS)
W76-03141

HEAT ASSIMILATIVE CAPACITY OF THE SANGAMON RIVER,
Illinois State Water Survey, Urbana.
C. T. Yang, and J. B. Stall.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 674, $4.00 in paper copy, $2.25 in microfiche. University of Illinois Water Resources Center Research Report No 104, September 1975. 31 p, 11 fig, 4 tab, 15 ref, 1 append.

Descriptors: *Thermal capacity, *Rivers, *Powerplants, *Illinois, Temperature, Water temperature, Costs, Heat transfer, Watersheds(Basins), Hydraulic properties, *Thermal pollution, *Waste assimilative capacity.
Identifiers: *Sangamon River(Ill).

A standard procedure for determining the distribution and variation of the heat assimilative capacity of a river has been developed. Hydraulic geometry equations for the Sangamon River Basin were used to provide the necessary hydraulic information. The study indicated that the total heat assimilative capacity of a river depends on the location of power plants, residual temperature, flow frequency, and seasonal variation of water temperature and wind speed. Water temperature data from 18 gaging stations in the Sangamon River Basin and wind speed data from 5 weather stations in or near the basin were used to determine the surface transfer coefficient for excess heat along the Sangamon River. This coefficient can be approximated by four equations for different ranges of wind speed. An analysis of the cost-capacity relationships for 29 power plants indicated that the cost per kilowatt of power output decreases with increasing power plant capacity. (Sims-ISWS)
W76-03142

MODELS OF LAND AND WATER ALLOCATION TO IMPROVE ENVIRONMENT AND WATER QUALITY THROUGH SOIL LOSS CONTROLS,
Iowa State Univ., Ames. Center for Agricultural and Rural Development; and Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-03164

A PROXIMATE BIOLOGICAL SURVEY OF SAND DIEGO BAY, CALIFORNIA,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5C.
W76-03170

PESTICIDE DEGRADATION BY MARINE ALGAE,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W76-03174

ANNUAL SUMMARY OF RESEARCH RESULTS FOR FISCAL YEAR 1974, MESA NEW YORK BIGHT PROJECT.
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
For primary bibliographic entry see Field 2L.
W76-03186

PREDICTIVE MODEL FOR PHOSPHORUS IN LAKES,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
W. J. Snodgrass, and C. R. O'Melia.
Environmental Science and Technology, Vol 9, No 10, p 937-944, October, 1975. 7 fig, 3 tab, 41 ref.

Descriptors: *Lakes, *Mathematical models, *Phosphorus, *Water management(Applied), Water quality control, Sewage treatment, Waste disposal, Model studies, Detergents, Forecasting.
Identifiers: Hydraulic loading, Phosphorus loading, Mean depth.

An input-output model has been developed to predict phosphorus in lakes. The purpose of this research was to formulate and verify such a model for decisionmaking in management of lake water quality and to determine causes for inverse relationships between several lake conditions and mean lake depth. A few previous models, both empirical and conceptual, were described. The proposed model showed excellent agreement between observed and predicted average phosphorus concentrations for lakes with a wide range of hydraulic detention times (one to 700 years) and mean depths (14 to 313 meters). Presently, the model is limited to lakes with aerobic hypolimnetic waters. Minimum data required for prediction are phosphorus loading, hydraulic loading, and mean depth. The model can be applied to determining the eventual response of a lake to a proposed change in phosphorus inputs such as the result of removal from detergents or by sewage treatment. The verification of the model's temporal response characteristics indicates that it can be used to predict the rate of changes which will occur in a lake following a change in P inputs. Thus, the model might be used to evaluate management alternative such as mixing, hypolimnetic aeration, and hypolimnetic withdrawal. Experimental evidence for a depth-dependent exchange of heat and materials across the thermocline region of lakes as well as for natural flocculation of particulate matter in the lakes was also presented. (Kramer-FIRL)
W76-03243

PRIVATE CONSTRAINTS ON GROUND WATER CONTAMINATION,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W76-03244

DISTRIBUTION AND BIOMAGNIFICATION OF HEXACHLOROPHENE IN URBAN DRAINAGE AREAS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering; and North Carolina Univ., Chapel. Hill School of Public Health.
J. L. Sims, and F. K. Pfaender.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 2, p 214-220, August, 1975. 2 fig, 1 tab, 10 ref.

Descriptors: *Pollutant identification, Water pollution sources, *Chemical wastes, Treatment facilities, Environmental effects, Public health, North Carolina, *Path of pollutants, *Distribution patterns, Organic wastes.
Identifiers: *Hexachlorophene, *Biomagnification, Hospital wastes.

A study was performed to determine the presence of hexachlorophene (HCP) in the waterways of the Upper Haw River Basin near Greensboro, North Carolina. The distribution data indicate that the two area waste water treatment plants are the major sources of HCP. Hospitals are probably the most significant sources of HCP to the treatment facilities. The organisms collected during the study all showed HCP concentrations significantly higher than those found in the water or sediment. Considerable biomagnification seems to be occurring in the water scavengers, crayfish and water boatmen. The HCP levels found in the water and

ment do not represent a direct danger to an health and are not toxic to environmentally ificant microorganisms. However, the ence for the biomagnification of HCP from low concentrations in water to potentially toxic ls warrants a more detailed study of the extent effects of HCP contamination of the environ-t. (Orr-FIRL)
5-03248

E OF WASTEWATER PHOSPHORUS IN L,
ert S. Kerr Environmental Research Lab., , Okla. Water Quality Control Branch.
. Enfield, and B. E. Bledsoe.
nal of the Irrigation and Drainage Division ceedings of ASCE, Vol 101, No IR3, p 145-155, tember, 1975. 5 fig, 1 tab, 18 ref.

criptors: *Phosphorus, *Phosphorus com-nds, *Soil management, Eutrophication, Sorp-, Waste water disposal, Environmental ef-s, Analytical techniques, Pollutant identifica-, Land management.

effects of applied phosphorus to a land appli-on waste water treatment system were con-red. Because phosphorus concentrations en-g surface water must be low enough to avoid accelerated eutrophication rate, both the unts of residual phosphorus in the soil solution the soil's ability to sorb applied phosphorus t be known. It proved possible to quantitative-roject the minimum residual concentration of sphorus in the soil solution by studying the bility products of the more important com-nds of aluminium, iron and calcium. The ntial maximum of phosphorus able to be ed by a soil was examined in relation to a mass nce equation and various sorption models. liction of phosphorus concentration versus and space for a given set of initial and boun-conditions was made by measurement of a dependent sorption isotherm used with a s balance analysis. (Beale-FIRL)
5-03250

E OF WASTEWATER BACTERIA AND SUSES IN SOIL,
lor Coll. of Medicine, Houston, Tex. Dept. of logy and Epidemiology.
. Gerba, C. Wallis, and J. L. Melnick.
nal of the Irrigation and Drainage Division ceedings of ASCE, Vol 101, No IR3, p 157-174, tember, 1975. 5 tab, 63 ref.

criptors: *Waste water treatment, *Waste osal, *Sewage disposal, *Microorganisms, teria, Viruses, Groundwater, Surface waters, er pollution effects, Laboratory tests, Soil ysis, Organic matter, Flow rates, Adsorption, lic health, Bibliographies.

h increasing use of land application for estic waste water disposal, mechanisms in-ed in the removal of microorganisms present e soil must be understood to minimize possi-public health problems. A review of current arch on the fates of bacteria and viruses in the is presented. Results of both laboratory and tests for various microorganisms were cribed. In most cases, it appeared that the sur-l of bacterial pathogens in soil is limited to less 2-3 months in temperature climates. How-, application of sewage in the long range could lt in their accumulation at the soil surface re they will be concentrated. Runoff from areas must be controlled so as not to pollute ace waters. The survival of enteric bacteria in is dependent upon soil moisture content, tem-ture, pH, and nutrient availability. Bacteria oval seems to occur primarily at or near the surface by straining as well as by sedimenta- and adsorption. Removal of viruses occurs ly by adsorption; degree of retention of es by soil particles is influenced by salt concentration, pH, presence of organic matter, flow rates, and the chemical composition of the soil. Because laboratory studies on viral and bacterial movement through soil are conducted under relatively constant conditions, they should be evaluated very carefully. (Kramer-FIRL)
W76-03251

THE NUMBER, GENERATION TIME AND PRODUCTION OF BACTERIA IN THE VOLGA AND ITS RESERVOIRS IN 1970, (IN RUSSIAN),
V. M. Kudryavtsev.
Mikrobiologiya, Vol 42, No 1, p 141-147, 1973, Illus. English summary.

Descriptors: *Rivers, *Reservoirs, *Bacteria, Biomass, Carbon dioxide, Water pollution sources.
Identifiers: Heterotrophic assimilation, USSR(Volga River), Ivanov method.

The total bacterial number in the Volga for a distance of over 3000 km for Kalinin to Astrakhan USSR in 1970 was ca. 2,400,000 - 3,600,000 per ml in May-June and 1,600,000 - 3,100,000 per ml in Sept.-Oct. The growth rate of the total bacterial number, calculated by heterotrophic assimilation of CO2, was 1.4 times in the summer and 1.3 times in the autumn higher than that determined by the Ivanov method. Heterotrophic assimilation of CO2 by the bacateria was ca. 2.2-7.7 micrograms/cal/1/day in May-June and decreased almost twofold in Sept.-Oct. The daily value of the bacterial biomass production was 36.7-128.0 micrograms/cal/l after the summer floodtime and 18.3-68.4 micrograms/cal/l in the autumn.--Copyright 1974, Biological Abstracts, Inc.
W76-03262

EFFECT OF FALLOUT OF WINDBRONE ZINC, LEAD, COPPER AND CADMIUM FROM A FUMING KILN ON SOIL GEOCHEMICAL PROSPECTING AT BERG AUKAS, SOUTH WEST AFRICA,
Cape Town Univ., South Africa. Dept. of Geochemistry.
J. W. Marchant.
Journal of Geochemical Exploration, Vol 3, No 1, p 191-198, March 1974. 2 fig, 3 tab, 6 ref.

Descriptors: *Heavy metals, *Soil contamination, *Soil analysis, *Geochemistry, *Air pollution effects, Leaching, Soil profiles, Zinc, Lead, Copper, Cadmium, Path of pollutants.
Identifiers: Windborne metals, Geochemical exploration, Fuming kilns.

A study has been made of the vertical and lateral extent of soil contamination due to windborne metal-rich dust from a recently erected fuming kiln. Zn and Pb fallout was detectable for several kilometers from the plant, and the distribution pattern is clearly wind controlled. Zn and Pb contamination, even when present in thousands of parts per million on surface, has not yet penetrated to 10 cm depth in the soil. Subsequent sampling for geochemical prospecting purposes has thus been done at 30 cm depths and is contamination free. Cu and Cd distributions due to fallout of these metals was found to be insignificant. It is possible that long term leaching of these metals and progressive downward migration will slowly contaminate the entire soil profile. (Hoyle-Vanderbilt)
W76-03302

MAJOR AND TRACE ELEMENT ANOMALIES IN STREAM SEDIMENTS OF THE TEIGN VALLEY OREFIELD,
Southampton Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 5A.
W76-03303

AN ELECTRON MICROSCOPE AUTORADIOGRAPHIC INVESTIGATION OF THE ACCUMULATION OF ZINC-65 BY A SPECIES OF EUTREPTIA,
Adelaide Univ., (Australia). Dept. of Botany.
For primary bibliographic entry see Field 5A.
W76-03308

A FOOD CHAIN MODEL OF CADMIUM IN WESTERN LAKE ERIE,
Manhattan Coll., New York.
R. V. Thomann, D. S. Szumski, D. M. Di Toro, and D. J. O'Connor.
Water Research Vol 8, p 841-849, 1974. 5 fig, 3 tab, 9 ref.

Descriptors: *Food chains, Model studies, *Cadmium, Tracers, *Biomass, *Lake Erie, *Trophic level, Statistical methods, *Statistical models.
Identifiers: Food chain models.

The spatial-trophic level structure of this model demonstrates the increase in concentration and general behavior, when released into the water environment, of potentially toxic substances, such as cadmium, as one proceeds up the food chain of Western Lake Erie. The increase results from two factors: the decrease in total biomass at higher trophic levels and the decrease in the uptake rate. The food chain model illustrates how interactive modeling between complex non-linear and linear compartment models can be accomplished. The problems of verification of data availability are highlighted by the model: estimates of transfer rates and biomass of different trophic levels must be on hand. As an example of a modeling structure still in an early stage of development, the reliance is on linear kinetics rather than possibly more realistic non-linear mechanisms. (Hoyle-Vanderbilt)
W76-03310

MINE DRAINAGE POLLUTION REDUCTION BY INHIBITION OF IRON BACTERIA.
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.
For primary bibliographic entry see Field 5G.
W76-03314

THE UTILISATION OF SEWAGE SLUDGE,
For primary bibliographic entry see Field 5D.
W76-03328

CONTAMINATION OF THE DANUBE IN BRATISLAVA BY SEWAGE 2ND COMMUNICATION (DIE SALMONELLA-VERUNREINIGUNG DER DONAU DURCH ABWASSER IN BRATISLAVA 2. MITTEILUNG),
For primary bibliographic entry see Field 5A.
W76-03344

WASTE-PRODUCT POLLUTION OF BODIES OF WATER AND WASTE-WATER PURIFICATION,
P. E. M. Schneider.
Available from the National Technical Information Service, Springfield, Va 22161, as N74-33858, $4.00 in paper copy, $2.25 in microfiche. NASA Technical Translation NASA TT F-15,934, September, 1974. 28 p, 34 ref. Translated from Max-Planck-Institut fuer Stroemungsforschung, Goettongen, West Germany, Report 2/1974, 53 p.

Descriptors: *Waste water treatment, *Water pollution, *Bodies of water, *Reviews, Currents, Rivers, Lakes, Oceans, Self-purification.

A literature review is presented on the problems of pollution of water bodies by wastes, and on waste water purification. The review is intended to provide examples of problems involved in water pollution and the treatment of water, and to encourage the formulation of further questions. Currents in bodies of waters are important in the self-

purification of the water. Oxygen dissolved at the surface of waters is transported by turbulent exchange and convection to deeper water, therefore, the quantity of oxygen available to organisms at these deeper levels which participate in self-purification is a function of current conditions. Discussion is presented on the seven categories of water pollution: solid, liquid, gaseous, thermal, photo, chemical, and biological. These types of pollution can be corrected by solid, liquid, gaseous, thermal, photo, chemical, and biological purification methods. The quality of general-purpose and potable water decreases with time because only part of the pollutants are removed by present purification methods. Surface waters in lakes and rivers must be used as additional water purifiers in the future. Studies on currents in rivers, lakes, and oceans and their possibilities for the maintenance and improvement of good river and potable water supplies are being planned. (Orr-FIRL)
W76-03352

A SUMMARY OF THE BIOGEOCHEMISTRY OF NITROGEN COMPOUNDS IN GROUND WATER,
California State Univ., Chico.
J. Behnke.
Journal of Hydrology, Vol 27, No 1/2, p 155-167, October 1975. 4 fig, 1 tab, 55 ref.

Descriptors: *Nitrogen compounds, *Nitrates, *Water quality, *Groundwater, *Nitrogen cycle, *Biochemistry, Ammonia, Nitrites, Fertilizers, Inorganic compounds, Nitrogen, Monitoring, Measurement, Data collections, Agricultural chemicals, Surface runoff, Water chemistry, Water pollution, Path of pollutants, Water pollution sources.
Identifiers: Chemical data, Agricultural practices, Shallow aquifers.

The biogeochemistry of nitrogen compounds in groundwater is exceedingly complex. The exclusive chemical monitoring of nitrates in groundwaters is overly simplistic and may lead to errors in data interpretation. Nitrogen compounds are biodegradable, and an understanding of the physical, chemical, and biologic systems through which transient water is moving is important in analyzing chemical data. Groundwater nitrate contamination is generally encountered in shallow aquifers which have direct or indirect hydraulic continuity with the ground surface. Surface sources of groundwater nitrate contamination related to man's activities include domestic sewage, agricultural practices, and high-density animal confinement. (Henley-ISWS)
W76-03358

HEXAVALENT CHROMIUM IN THE GROUND WATER IN PARADISE VALLEY, ARIZONA,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 4B.
W76-03364

A NUMERICAL MODEL OF THE CIRCULATION IN CIENFUEGOS BAY, CUBA,
Kiel Univ. (West Germany). Institut Fuer Meereskunde.
For primary bibliographic entry see Field 2L.
W76-03374

PB-210 IN PRECIPITATION IN JAPAN AND ITS IMPLICATION FOR TRANSPORT OF CONTINENTAL AERSOLS ACROSS THE OCEAN,
Hokkaido Univ., Hakodate (Japan). Faculty of Fisheries; and Hokkaido Univ., Sapporo (Japan). Dept. of Chemistry.
K. Fukuda, and S. Tsunogai.
Tellus, Vol 27, No 5, p 514-521, 1975. 5 fig, 1 tab, 26 ref.

Descriptors: Lead, *Precipitation(Atmospheric), *Aerosols, *Lead radioisotopes, *Radioactivity techniques, Air pollution, Heavy metals, Pollutants, Public health, Rain, Rainfall, Snowfall, Fallout, Analytical techniques, Tracers, Radioisotopes, Snow, Path of pollutants.
Identifiers: *Lead-210, *Japan, Hokkaido(Japan), Sea of Japan, Continenetal aerosols, Transport of aerosols, Dry fallout, Mineral constituents, Radon-222, Radioactive nuclides, Radon.

Total precipitation including rain or snow and dry fallout was collected once a month from February 1970 to March 1972 at 5 sampling stations in Hakkaido located from the coast of the Sea of Japan to inland. The monthly deposition rate of Pb-210 was determined together with other chemical constituents. The results are summarized as follows: (1) the deposition rate and the concentration of Pb-210 are remarkably high in winter; (2) a linear relation between the deposition rate of Pb-210 and the amount of rainfall is found in both summer and winter respectively; (3) as compared with the production rate of Pb-210, namely the exhalation rate of Rn-222 from the continent, the deposition rate of Pb-210 to the unit area at the coast of the Sea of Japan in winter is 2-4 times the exhalation rate of Rn-222 from the continent, and (4) the budget calculation of Pb-210 in the atmosphere shows that about 40% of aerosols transported from the continent are caught by snow and deposited over the Sea of Japan and the Japan Islands in winter. Therefore, it was concluded that the Japan Islands play an important role as a collector of the continental aerosols in winter. (Henley-ISWS)
W76-03385

MONITORING AGRICULTURAL POLLUTION USING NATURAL FLUORESCENCE,
Saskatchewan Research Council, Saskatoon.
For primary bibliographic entry see Field 5A.
W76-03387

NEW TRITIUM DATA ON MOVEMENT OF GROUNDWATER IN WESTERN FRESNO COUNTY, CALIFORNIA,
Geological Survey, Sacramento, Calif.
J. F. Poland, and G. L. Stewart.
Water Resources Research, Vol 11, No 5, p 716-724, October 1975. 8 fig, 2 tab, 10 ref.

Descriptors: *Water pollution sources, *Tritium, *Groundwater, *Path of pollutants, *California, Data collections, Sampling, Water wells, Nuclear explosions, Radioactivity effects, Evaluation.
Identifiers: *Fresno County(Calif), Thermonuclear tritium.

As a result of thermonuclear explosions that began in 1954, tritium concentrations in precipitation and streamflow in the northern hemisphere have fluctuated greatly. Well waters along two traverse lines in western Fresno County, Calif., were sampled in 1963 and tested for tritium concentration. Haskell et al, (1966) estimated from the apparent thermonuclear tritium concentrations that groundwater had moved westward in the lower water-bearing zone at a maximum velocity of 14-16.5 miles (23-27 km) in 9 years. The maximum velocities and permeabilities estimated from the 1963 sampling were about an order of magnitude greater than the velocities and permeabilities suggested by prior hydrologic and geologic evidence. Consequently, in 1966-1970 the U.S. Geological Survey sampled and tested the tritium concentrations of well waters along the same two traverses but also extended the sampling eastward. On the basis of these analyses it is concluded that (1) thermonuclear tritium had not invaded the lower zone by 1970 within the extent of the 1963 sampling and (2) although the maximum westward movement of groundwater in the lower zone from 1955 to 1970 is indeterminate, it has been less than 4 miles (6.5 km) from the recharge area in 15 years. (Woodard-USGS)
W76-03388

CHEMICAL QUALITY OF GROUND WATE IN THE NORTHERN PART OF THE AL BUQUERQUE-BELEN BASIN, BERNALILL AND SANDOVAL COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
W. L. Hiss, F. W. Trainer, B. A. Black, and D. R. Posson.
In: New Mexico Geological Society Guidebook 26th Field Conference, Las Cruces County, p 21 235, 1975. 3 fig, 4 tab, 28 ref.

Descriptors: *Water quality, *Chemical analysi *Groundwater, Aquifer characteristic Hydrogeology, *New Mexico, Geochemistry Groundwater movement, Water types, Chemic properties, Chemical reactions, Data collections.
Identifiers: Bernalillo County(N Mex), Sandov County(N Mex), Albuquerque-Belen basin(Mex).

Aquifers within Cenozoic strata in the Rio Gran rift constitute some of the most important groun water reservoirs in New Mexico. The A buquerque-Belen basin, the largest of the sout trending series of grabens that forms the R Grande rift, is about 30 miles wide and 90 mil long. Albuquerque, with a population of abo 285,000, pumps an average of 68.5 million gallo of water per day from wells tapping Cenozo aquifers. This stress on the aquifer system is i creased by pumping for the estimated additio 100,000 people living in nearby communities a suburban developments--perhaps as much as 23 million gallons of water per day. Water broug into the basin by underflow is of a calcium sodiu bicarbonate composition and some of it also co tains appreciable sulfate. Hydraulic interrelatio between the Rio Grande and the aquifers along i course control infiltration from the river. The inf trated water is of relatively good chemical qualit although the quality of Rio Grande water belo the Jemez River reflects the dissolved lo brought in from the Jemez uplift. (Woodar USGS)
W76-03394

WATER QUALITY,
Geological Survey, Menlo Park, Calif.
J. D. Hem, and T. D. Steele.
Reviews of Geophysics and Space Physics, V 13, No 3, p 461-468, July 1975. 211 ref.

Descriptors: *Water quality, *Reviews, *Unit States, Data collections, Networks, Analytic techniques, Model studies, Data processin Chemical properties, Water quality contr Evaluation, Documentation, *Bibliographies.

Significant contributions in the broad area water quality over the quadrennium 1971-1974 a highlighted. The diversity of subject areas with this topic heading and the large volume published research results necessitated the sele tion of representative indicator contributions. T references cited are believed to be indicative general trends in research and of the more imp tant developments during this period. Many ad tional citations could have been made. In t United States, recent federal legislation, speci cally the Federal Water Pollution Control A Amendments of 1972 (Public Law 92-500) and r lated research and monitoring activities, the bu of which have been coordinated, through the E vironmental Protection Agency and the Depa ment of the Interior's Office of Water Resour Research, have served to simulate many of t recent technological advances in several aspe of water quality. A brief discussion of the produ of some of these efforts is included. Efforts ha concentrated on developing or improving labora ry analytical methods, field-sampling procedu (including telemetering of instrument-monitori data and remote sensing), and interpretation data records (specific interest has been indicat in time trend analysis). This summary is concern primarily with chemical aspects of water quali (Woodard-USGS)
W76-03395

TER QUALITY, FOUNTAIN AND JIMMY MP VALLEYS, COLORADO, 1973,
logical Survey, Denver, Colo.
. Klein, and D. L. Bingham.
orado Water Conservation Board, Denver, er Resources Circular No 26, 1975. 27 p, 11 l plate, 5 tab, 22 ref.

criptors: *Water quality, *Surface waters, oundwater, *Irrigation water, *Colorado, Data ections, Sampling, Chemical analysis, ams, Water wells, Chemical properties, luation, Dissolved oxygen.
tifiers: Fountain and Jimmy Camp Val- Colo).

eries of dissolved oxygen profiles of Fountain ek indicates that, due to natural processes, the olved oxygen in the stream recovers from the ution load imposed in the vicinity of Colorado ngs, Colo. Monthly monitoring data indicate seasonal fluctuations in temperature and am discharge determine the distribution of hemical oxygen demand downstream from its of pollution loading. Oxygen removal coef- ents were determined for various points in the am. The main inorganic constituents in water n Fountain Creek at Pueblo are calcium, sodi- and sulfate. Hardness ranges from 170 to 920 igrams per litre, and the dissolved-solids con- tration ranges from 374 to 2,020 milligrams per . Groundwater in the area under-goes a general ease in dissolved-solids concentration in a nstream direction. The groundwater is clas- d in the medium to very high salinity hazard low to medium sodium hazard groups in rela- to suitability for irrigation. (Woodard-USGS) 5-03404

DROLOGIC DATA FOR URBAN STUDIES THE SAN ANTONIO, TEXAS TROPOLITAN AREA, 1973,
logical Survey, Austin, Tex.
primary bibliographic entry see Field 7C. 5-03406

MPLEXATION SIDE REACTIONS INVOLV- TRACE METALS IN NATURAL WATER TEMS,
fornia Univ., Davis. Div. of Environmental dies.
primary bibliographic entry see Field 2K. 5-03411

MN OXIDE COATINGS IN STREAM SEDI- NT GEOCHEMICAL SURVEYS,
rgia Univ., Athens. Dept. of Geology.
I. Carpenter, T. A. Pope, and R. L. Smith.
rnal of Geochemical Exploration, Vol 4, No 3, 9-363, September, 1975. 7 fig, 3 tab, 21 ref.

criptors: *Heavy metals, *Iron, *Manganese, ochemistry, *Sediments, Tennessee, Georgia, , Lead, Trace elements, *Path of pollutants, utant identification.
tifiers: Geochemical exploration.

present study is an initial attempt to evaluate ther or not the concentrations of certain als in the Fe-Mn oxide coatings on lithic, rtz and minus 80 fractions of th coexisting am sediment can be spacially related to known eral deposits in a drainage basin. Downstream ersion curves for cert ain trace metals were ined from two mineralized areas in Tennessee Georgia. Coatings are shown to effectively ect Zn and Cu mineralization in drainage basins are insensitive to Pb mineralization as Pb does concentrate in the coatings. The anoma- ackground ratio in the coatings is higher than he minus 80 fraction. Advantages of using tings versus the conventional minus 80-mesh tion in stream geochemical surveys are ussed. (Hoyle-Vanderbilt) 5-03412

PROBLEMS OF INDIVIDUAL SUPPLIES,
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-03434

LEGAL CONTROLS FOR PROTECTING UNDERGROUND SOURCES OF DRINKING WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5F.
W76-03435

CONTAMINANTS IN RAINWATER AND THEIR RELATION TO WATER QUALITY, PART II,
Suffolk County Dept. of Environmental Control, N. Y.
For primary bibliographic entry see Field 5A.
W76-03445

SIMULATION OF BOD AND DO BALANCE WITH RESPECT TO POLLUTED SHALLOW-RIVER (PART 2): SIMULATION EXAMPLE FOR MIDDLE COURSE TAMAGAWA (ASAI ODAKU KASEN NI OKERU BOD, DO SHUSHI NO SIMURASHON (DAI 2 HO): TAMAGAWA CHURYUIKI E NO TEKIYO REI),
S. Aiba, M. Okada, H. Otake, R. Sudo, and T. Mori.
Gesuido Kyokai-shi, (Journal of the Japan Sewage Works Association), Vol 12, No 132, p 26-37, May, 1975. 18 refs.

Descriptors: *Rivers, *Biochemical oxygen demand, *Dissolved oxygen, Water quality, Colorimetry, Model studies, *Simulation analysis, Chemical oxygen demand, Mannings equation, Spectrophotometry, Pollutant identification.
Identifiers: Japan.

Data obtained at eleven locations between Hanemura dike and Chofu dike, Japan, (total length 93 km) in August 1972 were used for a simulation model of BOD and dissolved oxygen balance in a polluted shallow river. Water temperature was recorded by the Japanese standard method using a glass thermometer; clarity was measured by a one m meter. Illumination was recorded by a 2501-A model illuminometer while pH value was measured by a colorimetric method. Dissolved oxygen, COD, total phosphorus, and BOD were also determined by appropriate standard Japanese methods. Nitrogen was determined by a spectrophotometric method. Dissolved oxygen and COD at Hinobashi ranged from 4.4 mg/liter at 10:30 p.m. to 19.9 mg/liter at 8:30 a.m., and from 2.2 mg/liter at 10:30 p.m. to 4.0 mg/liter at 1:30 p.m., on August 15, respectively. The overall photosynthesis and respiration rates for algae were measured and various parameters were estimated for the simulation. A greater second stage BOD load was obtained, due to inaccurate river bed area calculated by Mannings equation. Results of the simulation also showed lower BOD and restoration of dissolved oxygen at night. (Su-FIRL)
W76-03446

SOME INITIAL EFFECTS ON WATER QUANTITY AND QUALITY OF AN EXPERIMENTAL ROADING AND TIMBER HARVESTING OPERATION IN A VICTORIAN MOUNTAIN CATCHMENT,
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 4C.
W76-03447

THE INFLUENCE OF LAND USE ON STREAM SALINITY IN THE MANJIMUP AREA, WESTERN AUSTRALIA.
For primary bibliographic entry see Field 4C.
W76-03452

EVALUATION OF HEAT DISTRIBUTION IN A SOUTH CAROLINA RESERVOIR RECEIVING HEATED WATER,
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W76-03463

ENERGY COST-BENEFIT MODELS FOR EVALUATING THERMAL PLUMES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W76-03496

5C. Effects Of Pollution

WATER QUALITY IN IOWA STREAMS: SUMMARY OF A CONFERENCE HELD MARCH 1975.
Iowa State Univ., Ames. Dept. of Animal Ecology.
For primary bibliographic entry see Field 5A.
W76-03004

BLOOD OXYGEN CAPACITIES OF EELS ACCLIMATED TO FRESH-, BRACKISH-, AND SALT-WATER ENVIRONMENTS,
Bridgeport Univ., Conn. Dept. of Biology.
D. L. Guernsey, and J. J. Poluhowich.
Comparative Biochemistry and Physiology, Vol 52A, p 313-316, 1975. 2 fig, 1 tab, 22 ref.

Descriptors: *Eels, *Fish physiology, *Salinity, Oxygen, Analytical techniques, Water quality, Saline water, Brackish water, Freshwater, Water pollution effects.
Identifiers: *American eel, *Anguilla rostrata, *Blood oxygen capacities, Tissue analysis, Hematocrit.

Groups of American eels, Anguilla rostrata, were acclimated to three environmental salinities and their blood oxygen capacities determined. The brackish-water group exhibited the highest mean oxygen capacity and weight-specific oxygen capacity. Highly significant differences were demonstrated between the oxygen capacities of the freshwater and marine groups and between the brackish water and marine groups. A significant difference was not observed between the freshwater and brackish-water eels. Weight-specific blood oxygen capacities for the three groups exhibited an inverse relationship with body weight. The American eel, under different salinity regimes, showed a relationship between oxygen capacity and hematocrit, which appeared to be altered by ambient salinity. The lower oxygen capacities and hematocrits observed in the salt water-acclimated eels suggested that the yellow eel is programmed for a freshwater and/or brackish water existence and that acclimation to higher salinities disrupted its normal blood oxygen relationhsips. (Klein)
W76-03015

IN VIVO OXYGEN TOXICITY IN INVERTEBRATES AND VERTEBRATES,
Michigan State Univ., East Lansing. Dept. of Physiology.
R. J. Hoffert, D. A. Baeyens, and P. O. Fromm.
Comparative Biochemistry and Physiology, Vol 52A, p 351-353, 1975. 2 tab, 9 ref.

Descriptors: *Shrimp, *Fish, *Minnows, *Crabs, *Animal physiology, *Toxicity, *Oxygen, Invertebrates, Water pollution effects.
Identifiers: False pilchard, Harengula clupeola, Fathead minnow, Pimephales prommelas, Crayfish, Orconectes propinquus, Fiddler crab, Uca pugnax, Mouse, Mus musculus, Peneus setiferus.

Representatives of six diverse species (shrimp, Peneus setriferus; False pilchard, Harengula clupeola; Fathead minnow, Pimephales prommelas;

Crayfish, Orconectes propinquus; Fiddler crab, Uca pugnax; and mouse, Mus musculus) were exposed in vivo to 5 atm absolute of 100% oxygen. The toxic action of oxygen was measured by quantitating decreases in oxygen consumption. Terrestrial and marine organisms showed marked decreases in oxygen consumption within 3 hours of exposure. Species from fresh water habitats were more resistant to O2 toxicity. A possible explanation was suggested. (Klein)
W76-03016

SPECTRAL ANALYSIS OF OLFACTORY RESPONSES TO AMINO ACIDS IN RAINBOW TROUT, SALMO GAIRDNERI,
Tokyo Univ. (Japan). Zoological Inst.; and Tokyo Univ. (Japan). Faculty of Sciences.
M. Satou, and K. Ueda.
Comparative Biochemistry and Physiology, Vol 52A, p 359-365, 1975. 5 fig, 23 ref.

Descriptors: *Smell, *Organoleptic properties, *Rainbow trout, *Amino acids, Fish physiology, Biochemistry, Salmonids, *Spectroscopy, Pollutant identification, Water pollution effects.
Identifiers: Olfactory centers, Olfactory nerve.

Solutions of different amino acids elicited electrical olfactory responses with different spectral patterns when recorded from olfactory nerve or brain of rainbow trout, Salmo gairdneri. The responses of the olfactory centers had entirely different frequency structures from those of the olfactory nerve. An ability for olfactory discrimination between amino acids was suggested from the frequency spectral patterning of the responses in rainbow trout. (Klein)
W76-03017

IMPACT OF KRAFT PULP-MILL EFFLUENTS ON ESTUARINE AND COASTAL FISHES IN APALACHEE BAY, FLORIDA, USA,
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. J. Livingston.
Marine Biology, Vol 32, p 19-48, 1975. 14 fig, 7 tab, 98 ref.

Descriptors: *Pulp wastes, *Effluents, Speciation, Population, Species, Dissolved oxygen, Habitats, Productivity, Environmental effects, Water quality, Sampling, *Florida, *Estuarine environment, Estuaries, Water pollution effects.
Identifiers: Bay anchovy, Anchoa mitchilli, Apalachee Bay(Fla).

Offshore areas in north Florida that received kraft pulp-mill effluents (KME) displayed significant increases in color and turbidity and reductions in dissolved O2 compared with a nearby control area. Estuarine and marsh fish assemblages in areas of acute impact were severely reduced in numbers of individuals and species. Species diversity could not be used as an indicator of pollution per se, and was useful only when considered in conjunction with various other parameters. Transition areas (between polluted and unpolluted areas) showed increases in species diversity, individuals, and species. In general, the effects of KME on offshore fish assemblages appeared to be due to a complex combination of habitat alteration, reduced benthic productivity, and behavior reactions. Overall, there were some significant changes in the biota such as reduced dominance and productivity in polluted areas that were similar for the various types of organisms sampled. (Klein)
W76-03018

HEART RATE OF THE CRAB SCYLLA SERRATA (FORSKAL) IN AIR AND IN HYPOXIC CONDITIONS,
Rhodes Univ., Grahamstown (South Africa). Dept. of Zoology and Entomology.
B. J. Hill, and H. Koopowitz.
Comparative Biochemistry and Physiology, Vol 52A, p 385-387, 1975. 3 fig, 9 ref.

Descriptors: *Crabs, *Animal physiology, *Oxygen demand, Water quality, Respiration, Water pollution effects, Air pollution effects.
Identifiers: *Scylla serrata, Heart rate, *Hypoxia, Aerial exposure.

The heart-rate of the crab Scylla serrata in normoxic water but isolated from stimuli was initially 70-80 beats per minute but declined to 25-35 beat/minute after 72 hours. Exposure to air caused rapid brady-cardia. 50% of the initial heartrate was reached after 7-18 hours. The heart-rate increased in crabs exposed to hypoxic conditions but declined in oxygen tensions below 50 mm Hg. (Klein)
W76-03019

EFFECTS OF ARTIFICIALLY ELEVATED WATER TEMPERATURES ON THE GROWTH, REPRODUCTION AND LIFE CYCLE OF A NATURAL POPULATION OF PHYSA VIRGATA GOULD,
Texas Univ. at Arlington. Dept. of Biology.
R. F. McMahon.
Ecology, Vol 56, No 5, p 1167-1175, 1975. 3 fig, 55 ref.

Descriptors: *Thermal pollution, Texas, *Snails, *Mollusks, *Growth rates, *Life cycles, Life history studies, Effluents, Reproduction, Sampling, Heated water, Environmental effects, Waste water(Pollution), Water pollution effects.
Identifiers: *Physa virgata, Thermal effluent.

Samples were collected from two natural populations in Texas of Physa virgata, one affected by heated discharge from a power plant. Investigations of growth, reproduction, life cycle and the effects of effluent showed that each population had three generations per year. More northern physid populations have a simple annual pattern or at most two generations per year. Even without artificially elevated water temperatures the longer growing seasons which occurred in the southwestern USA allowed P. virgata populations to achieve three generations per year. The autecology of these two snail populations was remarkably similar; observed differences included a more rapid rate of growth of the second generation and a decrease in mean number of eggs laid in the discharge area. (Klein)
W76-03020

CADMIUM IN PLANKTON: ELEVATED CONCENTRATIONS OFF BAJA CALIFORNIA,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5B.
W76-03021

IMPACT OF SEWAGE ON THE DISTRIBUTION, ABUNDANCE AND COMMUNITY STRUCTURE OF ROCKY INTERTIDAL MACROORGANISMS,
California Univ., Irvine. Dept. of Population and Environmental Biology.
M. M. Littler, and S. N. Murray.
Marine Biology, Vol 30, No 4, p 277-291, 1975. 7 fig, 2 tab, 41 ref. OWRT A-054-CAL(1)

Descriptors: *Sewage, Wastes, *Domestic wastes, *Succession, *Intertidal areas, Habitats, *Biological communities, *Community development, Cyanophyta, Environmental effects, Life cycles, Speciation, Primary productivity, Water pollution effects, *Path of pollutants.
Identifiers: Sewage-Tolerant Organisms, Suspension feeders, Omnivores, Egregia laevigata, Halidrys dioica, Sargassum agardhianum, Phyllospadix torrey, Pterocladia capillacea, Serpulorbis squamigerus, Ulva californicus, Gelidium pusillum and Corallina officinalis.

The biological effects of a low volume domesti discharge were studied from February to Jun 1972. There were fewer species and less cove near the outfall than in nearby 'unpolluted' contro areas. The outfall biota was less diverse; a grea reduction in community stratification and com plexity occurred near the outfall due to th absence of Egregia laevigata, Halidrys dioica, Sar gassum agardhianum, and Phyllospadix torrey These were replaced by Ulva californica, Gelid um pusillum, Pterocladia capillacea, Serpulorbi squamigerus and Corallina officinalis. The critica effect of the outfall was suggested to be th decrease in environmental stability favoring rapid colonizers and more sewage-tolerant organism The outfall macrophytes, were characterized b relatively higher net primary productivities smaller growth forms, simpler and shorter li histories, and most were components of simple and early successional stages. (Klein)
W76-03023

DIVERSITY AND OVERLAP AS MEASURES O ENVIRONMENTAL QUALITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 6G.
W76-03024

CADMIUM IN NEW ZEALAND DREDG OYSTERS: GEOGRAPHIC DISTRIBUTION,
Marine Dept., Wellington (New Zealand). Fish ries Research Div.
For primary bibliographic entry see Field 5B.
W76-03025

GAS-BUBBLE DISEASE: MORTALITIES O COHO SALMON, ONCORHYNCHUS KISUTC IN WATER WITH CONSTANT TOTAL GA PRESSURE AND DIFFERENT OXYGE NITROGEN RATIONS,
National Marine Fisheries Service, Seattle, Was Northwest Fisheries Center.
R. R. Rucker.
Fishery Bulletin, Vol 73, No 4, p 915-918 1975. fig, 3 tab, 3 ref.

Descriptors: *Salmonids, *Salmon, *Gas *Nitrogen, *Oxygen, Pressure, Fish disease Bubbles, Mortality, Tolerance, Toxicity, Wat pollution effects.
Identifiers: *Gas-Bubble disease, *Oncorhynch kisutch, Fingerlings, *Coho Salmon.

Coho salmon (Oncorhynchus kisutch) fingerlin were subjected to a total gas pressure of 119% 13.6C with the 02/N2 varying from 50%/138% 229%/90%. The small fish (3.8-6cm) were the m resistant to gas bubble disease at the gas conc trations used. A drastic decrease in lethal effect individual rations of O2 and N2 occured betwe 159% O2/ 109% N2 and 173% O2/105% N2 at same total gas pressure (119). (Klein)
W76-03026

MERCURY AND IRON UPTAKE CYTOSOMES IN MANTLE EPITHELI CELLS OF QUAHOG CLAMS (MERCENAR MERCENARIA) EXPOSED TO MERCURY,
National Inst. of Environmental Health Scienc Research Triangle Park, N.C. Environmental To icology Branch.
B. A. Fowler, D. A. Wolfe, and W. F. Hettler.
Journal of the Fisheries Research Board Canada, Vol 30, No. 10, p 1767-1775, 1975. 7 fig tab, 19 ref.

Descriptors: *Animal physiology, *Mercu *Clams, *Iron, Path of Pollutants, Absorptio Metabolism, Bivalves, Toxicity, Bioass Analytical techniques, Metals, Pollutant ident cation, Water pollution effects.
Identifiers: *Quahog clams, *Mercenaria m cenaria, Bioaccumulation, Histology, Tissue an ysis.

cimens of the quahog clam, Mercenaria mer-aria, were placed in sea water containing mer-y (Hg++) concentrations of 0.1, 1, and 10 parts million (ppm) for 6 days. A dose-related in-ase of electron dense cytosomes was observed lectron microscopy in mantle tentacle epitheli-ells of mercury-treated clams. Energy disper- X-ray microanalysis of these cytosomes dis-ed the presence of high iron concentrations in on to mercury. Analysis of mantle fringes n the same clams by atomic absorption spec-copy showed marked changes in tissue iron ls of mercury-treated clams in comparison to rols. (Klein)
-03027

LING COMMUNITY CHANGES INDUCED THE THERMAL DISCHARGE OF A WAIIAN POWER PLANT,
aiian Electric Co., Inc., Honolulu. Environ-tal Dept.
McCain.
ironmental Pollution, Vol 9, p 63-83, 1975. 3 tab, 22 ref.

criptors: *Heated water, *Thermal pollution, perature, Electric power industry, Wildlife, nass, Population, Biological communities, iation, Water pollution sources, *Hawaii, er pollution effects, *Powerplants.

xamination of the epifauna collected on fifty ng panels was made to determine the in-ce of the thermal discharge from the Waiau n-Electric Generating Station on these organ- Many of the organisms were found to differ ficantly in abundance, biomass, and percent r between the thermally affected and non-af-d areas. Three species clusters or communi-were identified on the panels tidal non-ther- affected communities. The latter were ly separated by the 3C isotherm of tempera- above ambient which corresponded to a ner maximum of approximately 32C. (Klein)
03028

EFFECT OF TEMPERATURE AND NITY ON THE HEART BEAT OF CRAS-REA VERGINICA,
ecticut Univ., Noank. Marine Research Lab.
Feng, and W. Van Winkle.
parative Biochemistry and Physiology, Vol o. 3A, p 473-476, 1975. 3 fig, 1 tab, 6 ref.

riptors: *Temperature, *Salinity, *Oysters, al physiology, Water quality, Water pollution s.
ifiers: *Heart beat, Acclimation.

ostrea virginica from New Jersey and Con-ut were acclimated to low salinities in the itories. Heart beat was measured at various rature-salinity combinations to evaluate the of oysters to acclimate to the low salinity . Time of acclimation to low salinities did not icantly affect recovery of heart beat for stock. Heart beat of New Jersey oysters 10C was less inhibited following a gradual ase in salinity than following an abrupt ase in salinity. Rate of acclimation to lower ies appears to be less than 5 ppt per day. beat of Connecticut oysters showed a max-at intermediate salinities at 520 and 30 C, but beat was relatively insensitive to salinity at 5 C. Similar, although less conclusive, results btained with New Jersey oysters. (Klein)
3029

RACTION OF ODOUR AND FLOW PER-ION AND THE EFFECTS OF PARATHION E LOCOMOTOR ORIENTATION OF THE FISH CARASSIUS AURATUS L.,
A and M Univ., College Station. Dept. of y.
Rand, H. Kleerekoper, and J. Matis.

Journal of Fish Biology, Vol 7, No 4, p 497-504, 1975. 4 fig, 4 tab, 21 ref.

Descriptors: *Odor, *Fish behavior, *Organoleptic properties, *Water circulation, *Organophosphorus compounds, Water quality, Water pollution effects.
Identifiers: *Carassius auratus, *Locomotor orientation, *Parathion, *Goldfish.

The effects were studied of a 24 hour exposure to a subacute concentration of parathion on the locomotor orientation of mature goldfish, Carassius auratus, 26-30 cm long, in response to a food odor and a water flow differential, singly and in combination, in a free choice situation. Results suggested that short term exposure to the organophosphate affected not only the perception of food odor and flow individually, but also the interaction between these common environmental stimuli. (Klein)
W76-03030

THE INFLUENCE OF ACTIVITY LEVEL ON BRADYCARDIA IN TROUT (SALMO GAIRDNERI) DURING HYPOXIA,
Boston Univ., Mass. Dept. of Biology.
M. J. Weintraub.
Journal of Fish Biology, Vol 7, p 791-796, 1975. 2 fig, 19 ref.

Descriptors: *Salmonids, *Rainbow trout, *Analytical techniques, Radio communication systems, Fish physiology, Fish diseases, Oxygen, Methodology, Electricity, Water pollution effects.
Identifiers: *Hypoxia, Bradycardia, Heart rate.

Voltages associated with heartbeat were transmitted by radio from free-swimming rainbow trout (Salmo gairdneri). Variability in the bradycardia response associated with the hypoxic state was observed and appeared to be related to the normal activity state of the fish. Bradycardia as a physiological mechanism was discussed on the basis of this finding. (Klein)
W76-03031

EFFECTS OF VARIOUS CONCENTRATIONS OF DISSOLVED ATMOSPHERIC GAS ON JUVENILE CHINOOK SALMON AND STEELHEAD TROUT,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
E. M. Dawley, and W. J. Ebel.
Fishery Bulletin, Vol 73, No 4, p 777-796, 1975. 4 fig, 2 tab, 18 ref.

Descriptors: *Salmonids, *Chinook salmon, *Salmon, *Trout, *Gases, Juvenile growth stage, Pressure, Dissolved oxygen, Nitrogen, Argon, Fish physiology, Fish physiology, Fish behavior, *Rainbow trout, Mortality, Toxicity, Water pollution effects.
Identifiers: *Oncorhynchus tshawtscha, Salmo gairdneri, Coho salmon, Bioaccumulation, Tissue analysis, Blood chemistry.

Bioassays in shallow tanks with dissolved nitrogen and argon gas concentrations ranging from 100 to 125% of saturation in water at 15C were conducted to determine lethal and sublethal effects on juvenile chnook salmon (Oncorhynchus tshawytscha) and steelhead trout (Salmo gairdneri). Significant mortality of both species commenced at 115% saturation of nitrogen and argon. Over 50% mortality of both steelhead and chinook occurred in less than 1.5 days in water at 120 and 125% of saturation. Significant differences in swimming performance, growth and blood chemistry were measured in groups of fish tested at sublethal exposures in various concentrations of dissolved gases. Sublethal stress for 35 day at 110% dissolved nitrogen decreased normal swimming ability of chnook. Growth of both steelhead and chnook was affected by sublethal exposures in water saturated with atmospheric nitrogen and argon at 105, 110 and 115%. Blood chemistry was affected at sublethal exposures in water at 115% saturation. (Klein)
W76-03032

RENAL EXCRETION IN COHO SALMON (ONCORHYNCHUS KISUTCH) AFTER ACUTE EXPOSURE TO 3-TRIFLUOROMETHYL-4-NITRO-PHENOL,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
J. B. Hunn, and J. L. Allen.
Journal of the Fisheries Research Board of Canada, Vol 32, No. 10, p 1873-1876, 1975. 1 fig, 2 tab, 15 ref.

Descriptors: *Salmonids, *Salmon, *Organic compounds, *Fish physiology, Sodium, Potassium, Calcium, Magnesium, Chlorine, Bioassay, Toxicity, Water pollution effects.
Identifiers: *Oncorhynchus kisutch, *3-Trifluoromehtly-4-Nitrophenol, *TFM, Urine, Bioaccumulation, Excretion, *Coho salmon.

Coho salmon (Oncorhynchus kisutch) exposed to an acute, sublethal concentration of 3-trifluoromethly 1-4 nitrophenol (TFM) exhibited an increased output of urine when compared with controls, but the urinary excretion of Na, K, Ca, Mg and C1 was not affected. About 35 times more conjugated TFM than free TFM was excreted during the 24-hour study period. (Klein)
W76-03033

BLOOD AND LIVER ENZYMES IN RAINBOW TROUT (SALMO GAIRDNERI RICH) WITH EMPHASIS ON THEIR DIAGNOSTIC USE: STUDY OF CC14 TOXICITY AND A CASE OF AEROMONAS INFECTION,
Montreal Univ., (Quebec). Dept. of Biology.
J. G. Racicott, M. Gaudet, and C. Leray.
Journal of Fish Biology, Vol 7, p 825-835, 1975. 4 fig, 1 plate, 4 tab, 18 ref.

Descriptors: *Rainbow trout, *Salmonids, *Organic compounds, *Enzymes, Biochemistry, Fish diseases, Fish physiology, Analytical techniques, Toxicity, Water pollution effects.
Identifiers: *Carbon-Tetra-Chloride, *Aeromonas infection, Tissue analysis, Enzymatic activity.

The effect of one intraperitoneal injection of 1.33 ml of CC14 per kg of fish was studied. The activity of all enzymes in the blood (LDH, GOT, GPT, GR, GDH, CPK, G-6-Pase, and Alk Pase) increased. The enzymes reached maximal activity 12 hours after injection of diluted CC14. The levels of some enzymes in the liver were also examined. Histopathological observations were correlated with the enzymatic studies. An Aeromonas disease characterized by the destruction of the dermis, the exposure of the muscle, and by the presence of numerous petechiae in the liver allowed examination of the relationships between naturally induced tissue damage and enzyme levels in blood. The levels of seven blood enzymes were determined and the most significant modifications were observed for LDH and CPK which increased their concentration from 3 to 7 times respectively. A pyruvate saturation test demonstrated that LDH was probably from liver as it was observed after CC14 poisoning. The contribution of such biochemical studies in fish research was evaluated. (Klein)
W76-03034

EFFECTS OF TEMPERATURE ON FOOD INGESTION RATE AND ABSORPTION, RETENTION, AND EQUILIBRIUM BURDEN OF PHOSPHORUS IN A AQUATIC SNAIL, GONIOBASIS CLAVEAFORMIS LEA,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. W. Elwood, and R. A. Goldstein.
Freshwater Biology, Vol 5, No 5, p 397-406, 1975. 5 fig, 1 tab, 22 ref..

Descriptors: *Temperature, *Absorption, *Snails, *Phosphorus, *Phosphorus radioisotopes, Equilibrium, Water quality, Feeding rates, Retention, *Digestion, *Thermal pollution, Water pollution effects.
Identifiers: *Goniobasis clavaeformis, *Equilibrium burden, Bioaccumulation.

The effects of sublethal temperatures on feeding rates and phoshorus dynamics of the freshwater snail, Goniobasis clavaeformis, were determined and feeding rates were measured at four temperatures. Food ingestion rate incrfeased with increasing temperature up to 14C and decreased at temperatures above 14C. The elimination rate of absorbed phosphorus increased with increasing temperature. Mean retention times of absorbed phosphorus were estimated to be 34, 24, 20 and 6 days at 10, 13.8, 15, and 19.3C, respectively. The absorption efficiency of phosphorus was estimated to be constant at about 39% for all experimental temperatures. The equilibrium body burden of phosphorus in Goniobasis increased with increasing temperatures up to a maximum at 11-12C and then decreased above 12C. (Klein)
W76-03036

(THE EFFECT OF OXIDIZED MATERIAL ON THE VERTICAL DISTRIBUTION OF FRESHWATER BENTHIC FAUNA,
State Univ., Coll., Brockport, N.Y. Dept. of Biological Sciences.
W. B. Kirchner.
Freshwater Biology, Vol 5, No 5, p 423-429, 1975. 1 fig, 4 tab, 10 ref.

Descriptors: *Vertical distribution, *Oxidized material, Ostracoda, Harpacticoida, Cyclopida, Chironomidae.

The vertical distribution of representatives of the benthic groups: Ostracoda, Nematoda, Oligochaeta, Harpacticoida, Cyclopoida, and Chironomidae was determined. All groups had their highest numbers and biomass in the first 2 cm. The downward extent of oxidized material affected the distribution by dispersing the biomass more as seen by the deeper occurrence of groups when the oxidized material increased. Both the nematodes and oligochaetes were found to inhabit the first reduced layer when the oxidized material was less than normal. (Klein)
W76-03037

THE DEVELOPMENT OF CARP GONADS IN WARM WATER AQUARIA,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Institut fuer Kuesten-und Binnenfischerei.
Journal of Fish biology, Vol 7, p 775-782, 1975. 2 fig, 1 tab, 2 plates.

Descriptors: *Gonads, Histology.

The development of carp (Cyprinus carpio) gonads in warm water (23C) aquaria was described. Males matured at 6 months of age; females ripened at 14 months, and by 15 months 25% of these began spawning. Under natural conditions female European carp do not ripen until they are 4 years old. Sexual maturation of the ovaries, based on histological changes, was described in six stages and associated with changes in the female gonadosomatic index and the maximum ova diameter. Maturation of the tests occurred in four stages. Larger fishes became sexually mature before smaller fishes. (Klein)
W76-03038

SALINITY TOLERANCE OF LABORATORY-REARED LARVAE OF THE CALIFORNIA KILLIFISH, FUNDULUS PARVIPINNIS GIRARD,
California Univ., Irvine. Dept. of Population and Environmental Biology.
T. R. Rao.
Journal of Fish Biology, Vol 7, p 783-790, 1975. 3 fig, 2 tab, 18 ref.

Descriptors: *Killifishes, *Larvae, *Fish physiology, *Salinity, *Salt tolerance, Embryonic growth stage, Water pollution effects.
Identifiers: *Fundulus parvipinnis, Freshwater tolerance.

Newly hatched larvae of the California killifish (Fundulus parvipinnis) reared in the laboratory, were tolerant of salinities from fresh water to 70%. Their salinity tolerance was influenced by incubation salinity; larvae hatched in lower incubation salinities exhibited greater freshwater tolerance than those hatched in higher salinities. In gradual acclimation tests, the upper median lethal salinity for the larvae was 130%. Freshwater tolerance of the larvae decreased with age; yolk sac larvae were completely tolerant of fresh water while larvae more than 15 days old were least resistant. (Klein)
W76-03039

SALINITY TOLERANCE OF THE TIDEPOOL SHRIMP PALAEMON RITTERI HOLMES,
Pennsylvania State Univ., Wilkes-Barre.
W. W. Reynolds.
Comparative Boichemistry and Physiology, Vol 52, No 4A, p 665-667, December 1975. 2 fig, 2 tab, 11 ref.

Descriptors: *Water quality, *Salinity, *Salt tolerance, *Shrimp, Lehtal limit, Toxicity, Growth stages, Crustaceans, Water pollution effects, Desalination plants.
Identifiers: *Palaemon ritteri, *Tidepool shrimp.

The upper and lower incipient lethal salinity for non-moulting Palaemon ritteri were 47.5% and 10% at 20C respectively. Rescently moulted tidepool shrimp were unable to tolerate salinities of 15, 20, or 40%. Present salinities in some coastal environments of the Northern Gulf of California were approximate to the upper lethal salinity for moulting P. ritteri. Brine effluents from a proposed nuclear desalting plant could cause local salinity conditions in excess of the upper incipient lethal salinity for P. ritteri. (Klein)
W76-03040

EFFECTS OF BRIEF TEMPERATURE INCREASES ON LARVAE OF MULINIA LATERALIS (MOLLUSCA:BIVALVIA),
Virginia Inst. of Marine Science, Gloucester Point.
R. J. Diaz.
Journal of the Fisheries Research Board of Canada, Vol 32, No 10, p 1870-1872, 1975. 2 tab, 6 ref.

Descriptors: *Temperature, *Toxicity, *Larval growth, Stage, Heated water, Mortality, Mollusks, Water pollution effects, *Thermal pollution.
Identifiers: *Mulinia lateralis.

Temperature increases of 10, 15 and 20C for 30 minutes significantly increased 48-h mortality of Mulinia lateralis. Growth of surviving larvae was temporarily decreased only by a 20-degree temperature increase. No interaction was found between age of larvae when exposed and mortality after brief temperature increases. (Klein)
W76-03041

STUDIES ON THE SWIMMING MUSCULATURE OF THE RAINBOW TROUT, II. MUSCLE METABOLISM DURING SEVERE HYPOXIA,
Bristol Univ., (England). Research Unit for Comparative Animal Respiration.
I. A. Johnston.
Journal of Fish Biology, Vol 7, No 4, p 459-468, 1975. 3 tab, 48 ref.

Descriptors: *Rainbow trout, *Salmonids, *Fish physiology, *Fish diseases, Movement, Biochemistry, Water quality.
Identifiers: *Muscle movement, *Hypoxia, Tissu analysis, Anaerobic pathways.

Some aspects of anaerobic metabolism in the re and white (mosaic) muscles of the rainbow trou (Salmo gairdneri) have been studied during er vironmental hypoxia. Evidence has been obtaine for the operation of anaerobic pathways other tha glycolysis, especially in the superficial red muscl L-alanine and succinate were observed to accum late as anaerobic endproducts in this tissu Anaerobic glycolysis also increased significant during hypoxia, but only in the white muscl Glycogen stores were depleted by 70-85% in bo red and white muscle. Glucose increased in co centration in the red but not in the white muscle. an attempt to understand some of the species di ferences in the susceptibility of fish to hypoxia t results of the present study have been compar with an earlier study on the carp. The effect death from hypoxia on the levels of musc metabolites has also been studied. (Klein)
W76-03042

LONG-TERM EFFECTS OF AMINOPYRIDINE EXPOSURE TO BIRDS AN FISH,
Bureau of Sport Fisheries and Wildlife, Denv Colo. Denver Wildlife Research Center.
E. W. Schafer, Jr., and L. L. Marking.
Journal of Wildlife Management, Vol 39, No 4 807-811, 1975. 3 tab, 9 ref.

Descriptors: *Organic compounds, *Toxici *Birds, *Fish, Water quality, Channel catfi Water temperature, Environmental effects, Bio say, Water pollution effects.
Identifiers: *Avian frightening agent, aminopyridine, *Bioaccumulation, LC-50, N target wildlife, Bobwhites, Colinus virginian Starlings, Sturnus vulgaris, Coturnix quail, Cot nix coturnix, Mourning doves, Zenaida macrou Ictalurus punctatus, Bluegill, Lepo macrochirus.

The avian frightening agent, 4-aminopyrid (4AP), was tested on five avian and two fish s cies to assess the effects of long-term 4AP ex sure to nontarget vertebrates. LC-50's were de mined for mourning doves (Zenaida macrou bobwhites (Colinus virginianus), starlings (Stur vulgaris), and coturnix quail (Coturnix coturn Mortality in all avian species appeared to be result of acute poisoning, and no evidence of mulative toxicity was noted. In 96-hour st tests, channel catfish (Ictalurus punctatus) bluegill (Lepomis macrochirus) showed increas sensitivity to 4AP with time in test waters rang from very soft to very hard and from 12-22C 96-hour LC-50's for both species ranged from to 7.56 mg/liter (ppm). Toxicity appeared decrease with increasing water temperatures was generally unaffected by water hardness. the basis of the data presented and the curre registered rate for 4AP in agricultural crops, l term hazards to nontarget wildlife were judge be minimal. (Klein)
W76-03043

ACUTE EFFECTS OF METHYL MERCU TOXICITY IN CHANNEL CATF (ICTALURUS PUNCTATUS) KIDNEY,
Mississippi Univ., Jackson. Dept. of Anatomy.
M. W. Kendall.
Bulletin of Environmental Contamination Toxicology, Vol 13, No 5, p 570-578, May 197 fig, 1 plate, 1 tab, 29 ref. OWRT A-038-KY(6) 31-0001-3817.

Descriptors: Freshwater fish, *Catfis *Channel catfish, *Fish physiology, *Me *Mercury, Analytical techniques, Bioas Laboratory tests, Path of pollutants, Water p tion effects, Metabolism, *Toxicity
Identifiers: Kidneys, *Methyl mercury, *Subl concentrations, Bioaccumulation, Tissue anal

single intraperitoneal injection of 15 mg/kg ethyl mercuric chloride caused deposition of rcury in the kidney of channel catfish (Ictalurus nctatus), inhibition of histochemically localized ccinic dehydrogenase activity, and marked thology as evidenced by necrosis of renal tubu- cells and increased thickening of renal glomeru- basement membrane. (Klein)
76-03044

VIRONMENTAL SALINITY: ITS FAILURE INFLUENCE GROWTH OF ATLANTIC LMON (SALMO SALAR) PARR,
heries and Marine Service, St. Andrews (New nswick). Biological Station.
M. Shaw, R. L. Saunders, and H. C. Hall.
rnal of the Fisheries Research Board of nada, Vol 30, No 10, p 1821-1824, 1975. 2 fig, 1 , 18 ref.

scriptors: *Salinity, *Salt tolerance, *Growth es, *Atlantic salmon, Salmonids, Metabolism, h physiology, Environmental effects, Water lution effects.
ntifiers: Bioaccumulation.

wth of Atlantic salmon (Salmo salar) parr was lied at environmental salinities of 0.1, 10 and % in relation to daily rations of 0, 1.0, 1.5, 2.2, 2.9% of dry body weight. Instantaneous wth rates and food conversion efficiencies for in each salinity were similar. Maintenance ra- was slightly more in 20% than in either the nity approximately isosmotic with blood (10%) n fresh water (0.1%). (Klein)
5-03045

MPERATURE INCREASE CAN CAUSE PERECDYSONISM IN AMERICAN LOB- ERS (HOMARUS AMERICANUS) INJECTED TH ECDYSTERONE,
eries and Marine Service, St. Andrews (New nswick). Biological Station.
. Aiken, and S. L. Waddy.
rnal of the Fisheries Research Board of ada, Vol 30, No 10, p 1843-1845, 1975. 1 fig, 7

criptors: *Lobsters, *Crustaceans, mperature, Toxicity, Growth rates, Thermal ution, Water pollution effects.
tifiers: *American lobster, *Molting, rmones, *Ecdysterone, Bioaccumulation.

e lobster Homarus americanus the threshold for premolt acceleration by ecdysterone d be altered by changes in temperature. Two levels of ecdysterone were compared at three eratures. All doses remained subthreshold at but at 17C the 1.0 microgram dose caused recdysonism-rapid but abnormal completion emolt terminating in death at ecdysis. In con- , the 0.5 microgram dose remained reshold even at 21C. Results demonstrated a -temperature relation for response to injected sterone. (Klein)
-03046

E METHODOLOGY FOR APPRAISING TAMINANTS IN AQUATIC SYSTEMS,
lle-Northwest, Richland, Wash. Pacific hwest Lab.
rimary bibliographic entry see Field 5B.
03048

TE TOXICITY OF BENZENE, A COM- ENT OF CRUDE OIL, TO JUVENILE PED BASS (MORONE SAXATILIS),
nal Marine Fisheries Service, Tiburon, Calif. on Fisheries Lab.
Meyerhoff.
al of the Fisheries Research Board of da, Vol 30, No 10, p 1864-1866, 1975. 1 fig, 11

Descriptors: *Organic compounds, *Aromatic compounds, *Oil, *Striped bass, Salinity, *Toxicity, Juvenile growth stage, Fish physiology, Water pollution effects.
Identifiers: *Benzene, Morone saxatilis, Bioaccumulation.

The acute toxicity of benzene, a major constituent in crude oil of volatile aromatic compounds, to 1.5 plus or minus 0.5 gram juvenile striped bass (Morone saxatilis) was studied in a continuous flow laboratory bioassay system. At 17.4C and 29ppt salinity, the lethal threshold concentration and the 96-h LC50 for benzene were 10.9 microliters/liter. The 95% confidence interval was 10.9 plus or minus 0.2 microliters/liter and the probit line slope, 'S', was 1.1. Possible toxic mechanisms were discussed. (Klein)
W76-03049

INDUCED POLYPOIDY IN TILAPIA AUREA (STEINDACHNER) BY MEANS OF TEMPERATURE SHOCK TREATMENT,
New York Ocean Science Lab., Montauk. Dept. of Ichthyology.
R. J. Valenti.
Journal of Fish Biology, Vol 7, No 4, p 519-528, 1975. 1 fig, 3 tab, 41 ref.

Descriptors: *Genetics, *Chromosomes, *Reproduction, Cytology, Gonads, Growth stages, Fish physiology, Methodology, Analytical techniques, Temperature, Thermal pollution, Water pollution effects, *Tilapia.
Identifiers: Tilapia aurea, *Blue tilapia, *Polyploidy, *Temperature shock treatment, Gametes.

A technique for increasing ploidy in the blue tilapia, Tilapia aurea was investigated for the purpose of determining its effect on standard length. Gametes of T. aurea were stripped from ripe adults and eggs were fertilized with donor sperm from several males. A description of the extra-oral incubation system used for the embryos is provided. This system resulted in a maximum of 90% successful hatch. Normal egg development was interrupted by immersion of newly fertilized eggs (15 min post-insemination) in cold or hot water for various durations. The reliability of these techniques for inducing polyploidy was examined using increased volume of erythrocyte nuclei as a criteria for success. A cold shock of from 32C (ambient) to 11C for a 1 hour duration resulted in the largest incidence of polyploidy (75%). Polyploid fish were found to be larger than diploid siblings when measured at 14 weeks of age. (Klein)
W76-03050

PROBLEMS ASSOCIATED WITH LOW-SOLUBILITY COMPOUNDS IN AQUATIC TOXICITY TESTS: THEORETICAL MODEL AND SOLUBILITY CHARACTERISTICS OF AROCLOR 1254 IN WATER,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W76-03052

STUDIES OF TOLERANCE TO HEAVY METALS IN THE FLORA OF THE RIVERS YSTWYTH AND CLARACH, WALES,
University Coll. of Wales, Aberystwyth. Dept. of Botany and Microbiology.
R. O. McClean, and A. K. Jones.
Freshwater Biology, Vol 5, No 5, p 431-444, 1975. 6 fig, 8 tab, 31 ref.

Descriptors: *Metals, *Chlorophyta, Resistance, Iron, Lead, Copper, Zinc, Manganese, Growth rates, Water pollution sources, Mining, Diatoms, Water pollution effects.
Identifiers: Fontinalis squamosa, Scapania undulata, Hormidium rivulare, Wales, Ystwyth River, Clarach River.

The Ystwyth river was found to be heavily polluted with metals, especially below the areas of old lead mines. Hormidium rivulare was the most tolerant filamentous green algae present. Scapania undulata was a tolerant bryophyte found almost exclusively in polluted sites. In general, lower levels of Fe, Pb and Mn were found in Scapania as compared with the less tolerant Fontinalis squamosa. Zn65 tracing experiments demonstrated that both plants had similar uptake patterns for the metal. There was no change in the number of diatoms found upon Scapania when it was transplanted, but a reduction in numbers occurred on the transplanted Fontinalis when it started dying. Diatom flora compositions differed in the polluted and unpolluted sites. (Klein)
W76-03053

EFFECT OF SOUTH LOUISIANA CRUDE OIL AND NO. 2 FUEL OIL ON GROWTH OF HETEROTROPHIC MICROORGANISMS, INCLUDING PROTEOLYTIC, LIPOLYTIC, CHITINOLYTIC AND CELLULOLYTIC BACTERIA,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, P. A. Seeman, and R. R. Colwell.
Environmental Pollution, Vol 9, p 13-33, 1975. 16 fig, 6 tab, 45 ref.

Descriptors: *Bacteria, *Yeasts, *Oil wastes, *Microorganisms, *Fungi, Water pollution sources, Growth rates, Toxicity, Bays, Estuaries, Chesapeake Bay, Water pollution effects.
Identifiers: *Crude oil, *Fuel oil no 2, Bioaccumulation.

Muddy Creek, a sub-estuary of the Rhode River in Chesapeake Bay, was examined to determine the susceptibility of the autochthonous microorganisms to South Louisiana crude oil and No. 2 fuel oil. Muddy Creek sediment was found to be free of contaminating oil, whereas the crude oil was found to support growth of bacteria and the fuel oil to limit such bacterial growth. Normalizing the values with reference to the control cultures revealed that both the crude and fuel oils were toxic for the bacteria. The crude oil showed greater toxicity. (Klein)
W76-03054

A STUDY OF THE INTERTIDAL MACROFAUNA AROUND THE BP REFINERY (KENT) LIMITED,
City of London Polytechnic (England). Dept. of Biological Sciences; and Sir John Cass Coll., London (England). School of Science and Technology.
For primary bibliographic entry see Field 5B.
W76-03055

CONTRIBUTION TO THE STUDY OF THE EFFECT OF COPPER ON MYTILUS EDULIS DURING REPRODUCTIVE PERIOD,
Brussels Univ. (Belgium). Unite d'Histophysiologie.
W. Delhaye, and D. Cornet.
Comparative Biochemistry and Physiology, Vol 50, No 3A, p 511-518, 1975. 11 fig, 2 tab, 31 ref.

Descriptors: *Metals, *Mussels, *Toxicity, *Copper, Animal physiology, Reproduction, Spawning, Absorption, Respiration, Mortality, Water pollution effects.
Identifiers: *Bioaccumulation, *Mytilus edulis, Tissue analysis.

Aspects of copper toxicity in the mussel, Mytilus edulis, were studied. An acceleration in mortality occurred during the reproductive period. Respiration was similarly affected. Copper accumulation was high and rapid in the gills, and was also found to be at high levels in the mantle edge and foot. No accumulation organ was found, and after 48 hr the metal concentration decreased in all organs. A critical concentration seemed to exist with no

greater effects at higher concentrations. The spawning period corresponded with an acceleration of Cu uptake and consequently the critical concentration was more rapidly reached. (Klein)
W76-03056

CHROMATOPHORES OF THE TELEOST TILAPIA MELANOPLEURA -II. THE EFFECTS OF CHEMICAL MEDIATORS, MICROTUBULE DISRUPTING DRUGS AND QUABAIN,
Sao Paulo Univ. (Brazil). Departmento de Fisologia Geral; and Sao Paulo Univ. (Brazil). Inst. of Bio-sciences.
A. M. De L. Castrucci.
Comparative Biochemistry and Physiology, Vol 50, No 3A, p 457-462, 1975. 7 fig, 26 ref.

Descriptors: *Animal physiology, *Inhibitors, Enzymes, Biochemistry, Analytical techniques, Toxicity, Water pollution effects, *Teleosts.
Identifiers: *Tilapia melanopleura, *Tissue analysis, Pigments, Melanophores, Erythrophores, *Ouabain, *Adrenaline, Vinblastine, Sulphate, Colchicine, *Noradrenaline, Acetylcholine, Carbamylcholine.

Adrenaline and noradrenaline induced a fast aggregation of pigment granules in the melanophores and erythrophores of Tilapia melanopleura. Acetylcholine and carbamylcholine were ineffective in inducing pigment migration. Colchicine and vinblastine sulphate caused inhibition of both pigment aggregation and dispersion in melanophores and erythrophores by disruption of the microtubule pattern. Ouabain was a potent inhibitor of the migratory activity in melanophores and erythrophores, suggesting a Na-K- sensitive ATPase related to pigment movements. (Klein)
W76-03057

EFFECTS OF LARGE THERMAL DISCHARGES ON ICE-COVERED RIVERS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
P. P. Paily, J. F. Kennedy, E. O. Macagno, and G. Dagan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 712, $3.50 in paper copy, $2.25 in microfiche. Completion Report, Iowa State Water Resources Research Institute No 68, September 1975. 10 p, 8 ref. OWRT B-034-IA(1), B-041-IA(1). 14-31-0001-3886/3956.

Descriptors: *Ice, *Rivers, *Thermal pollution, Melting, Temperaure, Heat transfer, Mathematical models, Winter, Hydraulics, Hydrodynamics.
Identifiers: *Thermal response, Meteorological conditions, Equilibrium ice-cover thickness, Waste heat.

The effects of large thermal discharges on ice-covered rivers were investigated analytically, numerically, and experimentally. Field investigations were also performed to compare the theoretical results. The study was conducted in two phases. During the first phase, the thermal response of rivers to hot water discharges under cold period conditions was investigated. A numerical solution for the general case and a closed-form solution for a particular case were developed to determine the water temperatures and lengths of ice-free reaches for various combinations of climatic and thermal discharge conditions. During the second phase of the study the effects of thermal discharges on melting rates of ice covers were investigated theoretically and experimentally. Simplified relations were developed to determine the cover thickness at any time after the initiation of melting. Theoretical solutions were also developed to determine the thickness profile of the cover and the distance translated by the ice cover. The analytical models were supported by results derived from experimental studies.
W76-03139

A PROXIMATE BIOLOGICAL SURVEY OF SAND DIEGO BAY, CALIFORNIA,
Naval Undersea Center, San Diego, Calif.
T. J. Peeling.
Available from NTIS, Springfield, Va 22161 as AD-A007 469, $5.00 in paper copy, $2.25 in microfiche. Naval Undersea Center Report No. NUC TP 389, Revision 1, January 1975. 85 p, 14 fig, 12 tab, 67 ref, 6 append.

Descriptors: *Surveys, Sampling, Environment, Aquatic environment, *Water quality, *Biological communities, Industrial wastes, Domestic wastes, Effluents, *California, Data collections.
Identifiers: *San Diego Bay(CA).

The results of a survey of San Diego Bay conducted from December 1972 to June 1973 are presented, including data on the historical uses of the bay, changes in water quality, and past and present biological conditions. On the basis of these data the following conclusions may be drawn: After a period of decline, water quality in San Diego Bay is improving; Domestic and industrial discharges into the bay have been virtually eliminated, except for raw sewage originating aboard military and civilian vessels and limited amounts of cooling and thawing waters; State and local water quality requirements are stringent and well enforced, and it is estimated that most waste discharges into the bay, including all those from military sources, will be eliminated by 1980; and a number of marine organisms, including commercially and recreationally important species, are abundant in the bay. (Sinha-OEIS)
W76-03170

LONG-TERM VARIABILITY IN THE STRUCTURE OF SUBTIDAL BENTHIC COMMUNITIES IN PUGET SOUND, WASHINGTON, USA,
Nordic Council for Marine Biology, Biomsterdalen (Norway). Espegrend Biological Station.
U. Lie, and R. A. Evans.
Available from NTIS, Springfield, Va 22161 as COM-75-10379, $3.50 in paper copy, $2.25 in microfiche. Reprint from Marine Biology, Vol 21, No 2, p 122-126, 1973, Washington Sea Grant Program, WSG-TA 73-8.

Descriptors: *Benthos, Aqutic life, *Variability, *Biological communities, Ecosystems, Bodies of water, Estuaries, Sounds, *Washington.
Identifiers: Species composition, *Puget Sound(WA).

Data on benthic infauna from 4 permanent stations in Puget Sound off Seattle, USA, collected during 1963-1964, 1967, and 1969, revealed considerable stability in numbers of species and specimens and in diversity within stations among sampling dates. The species composition of the faunal assemblages also remained rather constant during the period of investigation, but the relative dominance among the numerically important species varied somewhat. Biomass data did not differ significantly in 1964 and 1969, but the 1967 data were considerably lower at all stations. (Sinha-OEIS)
W76-03173

PESTICIDE DEGRADATION BY MARINE ALGAE,
Wisconsin Univ., Madison. Dept. of Entomology.
G. M. Boush, and F. Matsumura.
Available from NTIS, Springfield, Va 22161 as AD-D008 275, $3.50 in paper copy, $2.25 in microfiche. Office of Naval Research, Naval Biology Program, Final Report, Task No. NR 306-061, April 1975. 22 p, 13 tab, 3 ref.

Descriptors: *Pesticide residues, *Algae, *Cyanophyta, *Chlorinated hydrocarbon pesticides, *Water pollution, Growth rates, Food chains, Dieldrin, Endrine, 2-4-5-T, DDT, DDD, Aquatic populations, Microbial degradation, Pesticide toxicity.
Identifiers: Anacystis nidulans, Anacystis quadruplicatum, Phenylmercuric acetate.

Various algae species were tested for their susceptibilities towards chlorinated hydrocarbon insecticides. Dieldrin, the most frequently found pesticidal contaminant in the U.S., and its analogs were found to inhibit the growth of certain algae species. Anacystis nidulans in particular showed marked susceptibility to endrin, dieldrin, ketoendrin and photodieldrin. This species was also susceptible towards dieldrin metabolites such a metabolite F and G. Among DDT metabolites DDD (TDE) was found to be the most toxic fo lowed by DDE, DDT and FW-152. Phenylmercu ric acetate was by far the most toxic among a pesticidal chemicals tested to both A. nidulans an A. quadruplicatum at the concentration of 1 pp Algae, along with other plankton, are known t bioaccumulate pesticides and thereby play a vit role in the process of food-chain accumulation c these micropollutants. Studies indicate that th rates of pick-up of pesticides are very rapid. T study the feasibility of constructing a mod ecosystem algae was used as a key food chain o ganism. TCDD, the most toxic contaminant 2,4,5-T does not really accumulate in the aquat organisms as compared to DDT. Algae as a who are not very active in degrading pesticidal chem cals in vivo. They were found to play a key role the process of environmental alteration pesticidal residues. The way they participate such processes was found to be through syne gistic actions on photochemical reactions. (Sinh OEIS)
W76-03174

EFFECTS OF OCEAN DISPOSAL ACTIVITI ON MID-CONTINENTAL SHELF ENVIRO MENT OFF DELAWARE AND MARYLAND,
Environmental Protection Agency, Annapol Md. Annapolis Field Office.
D. W. Lear, and G. G. Pesch.
Available from NTIS, Springfield, Va 22161 PB-239 256, $7.50 in paper copy, $2.25 microfiche. U.S. Environmental Protection Ag cy, Philadelphia, PA, Report No. EPA 903/9- 015, January 1975. 185 p, 44 fig, 22 tab, 2 appen

Descriptors: *Waste disposal, *Continental sh *Industrial wastes, *Sludge disposal, *Met *Water pollution, Paths of pollutants, Ocean culation, Absorption, Environmental effects, I tribution patterns, *Delaware, *Maryland, D collections.
Identifiers: *Ocean waste disposal, Waste ac mulation.

Observations made over a period of approxima one year on two mid-temperate mid-contine shelf ocean dumpsites showed the hydrogra regime was generally approximate the cla winter isothermal-summer stratified system, incursions of fresher water from the Delaw estuary and intrusion of offshore slope water found to influence this hydrographic reg Summer and winter density discontinuities ma fluence the distribution of conservative pollut The distribution of metals in bottom sediments organisms indicate these potentially toxic ma als persist in bottom materials, and are appare translocated as a result of hydrographic for This increases their potential toxicity to a rela ly great area, with its indigenous biota. The evidence of accumulation in benthis organi The benthic substrate, medium to fine sands, not apparently influence the distribution of metals examined in this nondepositional envi ment. The microtopographic ridges and sw observed directly from the submersible, ma fluence the local distribution of pollutants as as biota. Observations of the benthic infaun as yet incomplete, and may influence current clusions when analyzed. Dumping operation the acid waste source and of the sewage s materials are apparently separately distribut the environment. An area of at least 1000 s nautical miles was affected. (Sinha-OEIS)
W76-03175

SICAL, CHEMICAL, AND BIOLOGICAL
RACTERISTICS OF NEARSHORE ZONE
SAND KEY, FLORIDA, PRIOR TO BEACH
TORATION. VOLUME I,
onal Marine Fisheries Service, Panama City,
Gulf Coastal Fisheries Center.
rimary bibliographic entry see Field 2L.
03177

ERGENT PHOSPHATE BAN YIELDS LIT-
PHOSPHORUS REDUCTION, PART I,
ue Univ., Lafayette, Ind. Dept. of Environ-
al Engineering.
rimary bibliographic entry see Field 5A.
03235

DICTIVE MODEL FOR PHOSPHORUS IN
ES,
a Carolina Univ., Chapel Hill. Dept. of En-
mental Sciences and Engineering.
rimary bibliographic entry see Field 5B.
03243

DUCTION OF MACROPHYTES OF SOME
ES IN THE PSKOV REGION, (IN RUS-
),
emiya Nauk SSSR, Leningrad. Botanicheskii
it.
Belavskaya, and N. B. Serafimovich.
Resur. Vol 9, No 3, p 355-369, 1973. Illus.
fiers: Charophyta, Dissection, Elodea-
lensis, *Lakes, *Macrophytes, *Production,
an-SFSR, Shoreline, *USSR(Pskov region),
trophic lakes.

of an alkalitrophic type of development, to
the investigated lakes (Alol, Beloe, Os-
, and Krivoe) of the Pskov region (Russian
, USSR) belonged, are characterized by a
erable diversity of the flora of macrophytes.
egree of overgrowth of the lakes depended
much on their area as on the degree of dis-
n of the shore line, number of islands, and
ter of the drop of the bottom in the littoral
With the exception of Lake Krivoe, sub-
d vegetation, especially communities of
phyta and Elodea canadensis, predominated
vegetation cover of the lakes. In view of the
roductivity of Charophyta and the large
ccupied by it, lakes with a predominance of
rged vegetation gave the maximum annual
tion of air-dried matter (125.3 g/m2 for
lol and 117.0 g/m2 for Lake Ostrovito). The
tion of organic matter depended to a con-
le extent both on the productivity of the
nt plants and overgrowth areas and on the
al composition of the macrophytes.
hyta, haveing a high content of mineral
unds, contributes to the lake considerably
anic matter than the corresponding mass of
d vegetation.--Copyright, 1974, Biological
cts, Inc.
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T OF HALOGENS AND OZONE ON
TOSOMA OVA,
a Polytechnic Inst. and State Univ.,
burg. Dept. of Civil Engineering.
cado-Burgos, R. C. Hoehn, and R. B.
an.
Water Pollution Control Federation, Vol
10, p 2411-2419, October, 1975. 4 fig, 2 tab,

tors: *Ozone, *Waste water treatment,
ection, *Public health, Chlorine, Bromine,
*Halogens, Toxicity, Effluents, Water pol-
urces.
ers: *Schistosoma mansoni.

chnical data were compiled on the effec-
of common disinfectants applied at dif-
osages and contact times against the ova of
oma mansoni. These data on chlorine, iodine, bromine, and ozone, were evaluated for design of disinfection units in future waste water treatment plants. Schistosomias is a human parasitic disease that has been linked to the discharge of waste water into waterways; however, few treatment plants in high incidence areas practice disinfection. In this investigation, S. mansoni ova suspended in secondary treated waste water effluents were exposed to the various disinfectants. Although the exact mechanism is not known, chlorine was more effective than either iodine or bromine in schistosome ova elimination. In tests for ozone disinfection, difficulties were encountered because the ozone generating method was extremely inefficient. Additionally, the ozone demand of waste water made disinfection of schistosome ova by ozone difficult. Only at tests with 40 mg/liter was a complete elimination of the schistosoma possible. However, ozone does not form any toxic addition products with constituents of waste water as halogens do, and free ozone residuals are short-lived, especially in water containing organics. (Kramer-FIRL)
W76-03252

STUDY OF FLUORINE IN THE UKRAINE AND THE ENDEMIC FLUOROSIS CONNECTED THEREWITH (IZUCHENIE FTORA NA UKRAINE I SVYAZANNOGO NIM ENDEMICHESKOGO FLYUROZA),
R. D. Gabovich, and G. A. Stepanenko.
Gigiena i Sanitariya, No 7, p 13-16, 1975. 1 fig, 3 tab.

Descriptors: *Water supply, *Fluorine, Soils, Public health, Water sources, Groundwater, Artesian wells, Foods.
Identifiers: Dental fluorosis, *Ukraine, USSR.

A dynamic study has been conducted for the past 25 years on the fluorine content in the soils, natural water (both ground and artesian), foodstuffs, and daily food rations of the populations in four geochemical zones of the Ukraine in connection with the shifts in the incidence of dental fluorosis. The data of this study is presented. The causes of the decreases of the incidence of dental fluorosis in the case of a comparatively stable fluorine content in the environment are discussed. (Orr-FIRL)
W76-03254

HYGIENIC ASSESSMENT OF THE FLOTATION REAGENT T-66 IN THE WATER BODIES AND ITS MAXIMUM PERMISSIBLE CONCENTRATION (GIGIENICHESKAYA OTSENKA FLOTOREAGENTA T-66 V VODE VODOEMOV I EGO PREDEL'NO DOPUSTIMAYA KONTSENTRATSIYA),
L. V. Kudrin, S. M. Pavlenko, S. C. Zamyslova, and A. N. Sergeev.
Gigiena i Sanitariya, No 7, p 43-46, 1975. 1 fig, 1 tab.

Descriptors: *Water pollution sources, *Water pollution, Toxicity, Bodies of water, Standards, Bioassay, Public health.
Identifiers: Flotation agent T-66, Threshold concentration, Maximum allowable concentration.

The flotation reagent T-66 is a possible source of pollution in bodies of water. A complex series of hygienic investigations was performed in order to determine the features of the effect produced by T-66 on the organoleptic properties of water, and the sanitary regimen of the water body. Its effects on warm-blood animals under conditions of acute and chronic sanitary-toxicological experiments were determined with the use of a wide range of modern methods. A special toxicological index of noxiousness was proposed for the hygienic standardization of the flotation reagent in water bodies. A concentration of the substance at a level of 0.2 mg/liter was found to be subthreshold in warm-blooded animals; the concentration of 2.0 mg/liter was found to be threshold. The maximum permissible concentration of the flotation reagent T-66 is 0.2 mg/liter. (Orr-FIRL)
W76-03255

THE NUMBER, GENERATION TIME AND PRODUCTION OF BACTERIA IN THE VOLGA AND ITS RESERVOIRS IN 1970, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W76-03262

VARIATIONS IN THE HYDROCHEMICAL REGIME OF THE COASTAL WATERS IN WINTER INFLUENCED BY MACROPHYTES, (IN RUSSIAN),
Murmanskii Morskoi Biologicheskii Institut (USSR).
L. E. Pozdnyakova, G. P. Garkavaya, and A. N. Golovkin.
Okeanologiya, Vol 13, No 3, p 426-431, 1973. Illus. (English summay).
Identifiers: *Algae, *Coastal waters, *Hydrochemical regime, *Macrophytes, Nitrogen, Phosphorus, Seasonal, *USSR(Dalnezelevetskaya Guba Bay), Winter, Absorption, Bays, Nutrients.

The experiments with the mass species of littoral and sublittoral algae made by the bottle method in the Dalnezelenetskay Guba (Bay) (USSR) in March 1968 are discussed. The semi-diurnal exposure reveals a specific character of nutrient salt consumption and the isolation of oxygen, organic N and P depending on a taxonomic position of algae. The winter biomass of macrophytes in the Murman coastal waters of the Barents Sea consumes dozens of kg of P and hundreds of kg of mineral N from the sea water per day. Due to the isolation by algae, the sea water becomes enriched in dissolved organic matter and oxygen. The coastal thickets of macrophytes change the stock of nutrient salts during the 2nd half of winter (period of the least stability of water masses) resulting in great diurnal fluctuations of chemical ingredients in the coastal water.--Copyright 1974, Biological Abstracts, Inc.
W76-03305

GROWTH RESPONSE OF THE GREEN ALGAE CHLORELLA VULGARIS TO SELECTIVE CONCENTRATIONS OF ZINC,
Herbert H. Lehman Coll., Bronx, N.Y. Dept. of Biological Sciences.
J. W. Rachlin, and M. Farran.
Water Research, Vol 8, p 575-577, 1974. 1 fig, 4 tab, 11 ref.

Descriptors: *Heavy metals, *Zinc, *Chlorella, *Growth rates, *Algal toxins, *Aquatic algae, Water pollution effects.
Identifiers: *Cell systems.

Effects of a divalent metal toxicant, zinc, on the growth response and therefore productivity of the green algae chlorella vulgaris were evaluated. The cultures were grown in modified Bristol's medium at 15.5 deg.C. with a program of 16 h light and 8 h dark. The concentration of zinc which reduced the growth rate of the test population of this alga, during a 96 h exposure, by 50%, was 2.4 plus or minus 0.02 ppm. The statistical technique of probit analysis was used on the data to calculate this effective concentration. The test design concerns itself with productivity reduction rather than standard survival of the test organism, and allows for the design of parallel studies in which the same technique can be used to assess the effects of toxicants on both animal and plant cell systems. (Hoyle-Vanderbilt)
W76-03307

A FOOD CHAIN MODEL OF CADMIUM IN WESTERN LAKE ERIE,
Manhattan Coll., New York.
For primary bibliographic entry see Field 5B.
W76-03310

EFFECTS OF LEAD CHLORIDE ON CHLOROPLAST REACTIONS,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
M. B. Bazzaz.
Environmantal Letters, Vol 6, No 3, p 175-191, 1974. 3 fig, 2 tab, 37 ref.

Descriptors: *Heavy metals, Pollutants, *Environmental effects, *Photosynthesis, Vegetable crops, Chemical reactions, Toxicity, *Lead.
Identifiers: Lead ions, Lead chloride, *Chloroplast reactions, *Photosystem activity, Conformational changes, Thylakoid membranes, Lead treatment, Tris-washing, Chlorophyll fluorscence, Lead pigment systems, Biochemical reactions, Maize.

Experimental data suggest multiple and complex effects of lead ions on chloroplast reactions. Lead chloride causes inhibition or stimulation of photosystem II activity in maize chloroplasts depending on the pH of the reaction media. At pH 7.8, an inhibition of 16 to 39% with 0.75mM to 9mM PbC12 is observed; while at pH 6.5 a stimulatory effect of 20% is observed with 9mM PbC12. These effects cannot be explained by the uncoupling of photophosphorylation, or by the ability of PbC12 to donate electrons to photosystem II. A common site of inhibition between water and the primary electron donor, Z, of the photosystem II for lead treatment and Tris-washing (0.8M, pH 8.0) of chloroplasts is suggested. Lead salts (0.9mM) at both pH 6.5 and 7.8 induced about 20% inhibition of the variable chlorophyll a fluorescence, and an increase in the ratio of pigment system I to II fluorescence upon the addition of lead salts at both pHs - an opposite effect to that induced by salts of other divalent ions such as Mg2+. Lead salts (0.9mM to 9mM) cause 10 to 20% increase in the 540nm absorbance change, reflecting a decrease in spaces between thylakoids, over that of untreated chloroplasts. The results are explained in terms of lead-induced conformational changes in thylakoid membranes of chloroplasts, leading to changes in energy distribution between pigment systems I and II. (Gregory-Vanderbilt)
W76-03317

EFFECTS OF CADMIUM NITRATE ON SPECTRAL CHARACTERISTICS AND LIGHT REACTIONS OF CHLOROPLASTS,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
M. B. Bazzaz.
Environmental Letters, Vol 6, No 1, p 1-12, 1974. 4 fig, 22 ref.

Descriptors: *Heavy metals, *Pollutants, *Environmental effects, *Photosynthesis, *Vegetable crops, Toxicity, Chemical reactions, Cadmium, Corn(Field), *Chlorophyll.

Cadmium, a major toxic environmental contaminant, in the form of Cd2+, was shown to be a potent inhibitor of photosynthesis in mesophyll chloroplasts from maize. Photosystem (PS) II activities (2, 6 dichlorophenol indophenol photoreduction and the variable fluorescence yield of chlorophyll (Ch1)a) are inhibited strongly by 0.5 mM cadmium, supplied as Cd(NO3)2. Diphenyl carbazide was found to restore these activities suggesting that cadmium inhibits PSII activity at the oxygen evolving site between water and Y (the first secondary electron donor of PSII). PSI activity (light induced P700 oxidation) was not sensitive to the concentrations of cadmium that inhibit water oxidation almost completely. Absorption and fluorescence studies showed that cadmium causes a 20% to 30% decrease in the total chlorophylls, 15% to 25% decrease in the ratio of Chla/Chb, and a 20% to 25% decrease in the ratio of the short to the long wavelength forms of Chla. (Gregory-Vanderbilt)
W76-03318

EFFECTS OF DETERGENT FORMULATION ON WASTEWATER CHARACTERISTICS AND TREATMENT,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 5D.
W76-03329

STUDIES OF GULL LAKE, MICHIGAN: I. SEASONAL AND DEPTH DISTRIBUTION OF PHYTOPLANKTON,
University of East Anglia, Norwich (England). School of Environmental Sciences.
B. Moss.
Freshwater Biol, Vol 2, No 4, p 289-307, 1972, Illus.

Descriptors: *Phytoplankton, *Lakes, *Diatoms, *Michigan, Distribution patterns, Cyanophyta.
Identifiers: Asterionella formosa, Chroococcus, Cyclotella michiganiana, Fragilaria crotonensis, *Gull Lake(Mich), Synechococcus, Synedra acus.

The seasonal and depth distribution of phytoplankton in Gull Lake, a moderately large, temperate, dimictic, recreational lake in southern Michigan, is described and discussed. Diatoms (Fragilaria crotonensis, Cyclotella michiganiana, Asterionell formosa and Synedra acus) dominate the spring phytoplankton. Populations of cryptomonads, green flagellates, and non-bloom-forming blue-green algae (Chroococcus and Synechococcus) grow mainly in summer. Diatoms grew under the winter ice, and objections are lodged to the classic explanation of seasonal growth in temperate lakes, and to a recent hypothesis concerning the 'paradox of the plankton'. Two raphe-bearing large diatom species were considered to be truly planktonic. A Synechococcus sp. was similar to that described previously only from Loch Leven.--Copyright 1973, Biological Abstracts, Inc.
W76-03338

WATER AND THE SOUTH FLORIDA ENVIRONMENT,
Geological Survey, Miami, Fla.
H. Klein, J. T. Armbruster, B. F. McPherson, and H. J. Freiberger.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-236 951, $9.00 in paper copy, $2.25 in microfiche. Water-Resources Investigations 24-75, August 1975. 165 p, 33 ref.

Descriptors: *Environmental effects, *Water quality, *Surface waters, *Groundwater, *Florida, Evaluation, Water resources, Hydrologic data, Water pollution sources, Urbanization, Industrial wastes, Municipal wastes, Insecticides, Land use, Saline water intrustrusion, Recreation facilities, Waste disposal, Aquifers, Ecology, Watershed management, Planning.
Identifiers: Southern Florida.

The population and industrial growth and the urban sprawl in south Florida has caused concern to agencies involved in land-use planning and water management as to the adequacy of the fresh-water supply, and of the changes in environmental factors that could affect both the quantity and the quality of the fresh-water supply. This report describes the surface-water and groundwater resources of south Florida, the hydrologic system, past and present, and the interrelation of fresh water with estuarine and marine waters. Also considered are the problems, present or future, related to the hydrologic environment that involve human, animal, and plant life. The report provides alternative solutions to current environmental problems, with emphasis on alternatives that might be used to minimize alteration of the environment of south Florida in years to come. (Woodard-USGS)
W76-03402

THE EFFECTS OF TEMPERATURE UPON TE TOXICITY OF CHEMICALS TO AQUATIC O GANISMS,
Virginia Polytechnic Inst. and State Uni Blacksburg. Dept. of Biology; and Virgi Polytechnic Inst. and State Univ., Blacksbu Center for Environmental Studies.
J. Cairns, Jr., A. G. Heath, and B. C. Parker.
Hydrobiolgia, Vol 47, No 1, p 135-171, July, 19 2 fig, 1 tab, 126 ref.

Descriptors: Pollutants, *Heavy met *Temperature, *Toxicity, Aquatic life, Trace ments, Laboratory tests, Animal physiolo Bioassay, Toxins, Water pollution, Ani Pathology, Mortality, Environmental effe Aquatic microorganisms, *Thermal polluti Thermal stress, Poisons, Mercury, Ammo Pesticide toxicity, Herbicides, Fish, Water po tion effects.
Identifiers: *Lethal concentrations, Thresh concentration, *Cyanide toxicity.

A review is presented of the available data on relationship between water temperature and effects of toxic chemicals on aquatic organism large number of articles appear on either temp ture or chemical effects, but very few apply t direct interaction between temperature and ch cal toxicity. The data come from laboratory t field data in this area are almost non-existent. aquatic animals and microorganisms are incl in the survey. Laboratory tests involving monia, cyanide, and trace metals including cadmium, copper, chromium, and mercury described. Most studies reported were bioas of fish which measured changes in the lethal of toxic substances or in the time required death at a given concentration as a functio water temperature. Pesticides, herbic phenols, and chlorine are also discussed. The tinent data from each laboratory test are give the probable physiological mechanism described. (Davis-Vanderbilt)
W76-03413

THE EFFECTS OF DESALINATION BR ON CRASSOSTREA VIRGINICA (GMELIN
Dow Chemical Co., Freeport, Tex. Texas Div
E. F. Mandelli.
Water Research, Vol 9 p 287-295, 1975. 5 fig, 17 ref.

Descriptors: *Desalination, *Desalination w *Brine disposal, *Oysters, *Toxins, Reproduction, Copper, Bioassay.
Identifiers: Crassostrea virginica.

The effects of seawater diluted desalination on juvenile and adult specimens of C. vir from the Gulf of Mexico have been assessed long term seasonal bioassay tests (60 days relatively high copper content of the brine tions (19.3-43 micrograms total Cu per 1, 60 a soluble fraction) produced toxic chronic on both juvenile and adult oysters. The effe cluded high mortality rates during the spri summer season, enhanced development parasite fungus L. marina in the oysters, accumulation in the oysters' tissues depend copper concentrations of the seawater-brin tures and natural physiological activity, and oration of reproductive activity. (Hoyl derbilt)
W76-03414

NEW ENVIRONMENTAL HEALTH PROB IN WATER SUPPLY,
National Inst. of Environmental Health Se Research Triangle Park, N.C.
For primary bibliographic entry see Field 5E
W76-03425

EMIOLOGY OF WATERBORNE DISEASE
IE UNITED STATES 1971-1973,
r for Disease Control, Atlanta, Ga. Bureau
demiology.
imary bibliographic entry see Field 5F.
)3426

RIC VIRUSES AND DRINKING WATER
LIES,
Carolina Univ. at Chapel Hill. Dept. of En-
ental Sciences and Engineering.
imary bibliographic entry see Field 5F.
3427

VIEW OF PROBLEMS ASSOCIATED
INORGANIC CONTAMINANTS IN
KING WATER,
nmental Protection Agency, Cincinnati,

mary bibliographic entry see Field 5F.
3429

INITIAL EFFECTS ON WATER QUAN-
AND QUALITY OF AN EXPERIMENTAL
NG AND TIMBER HARVESTING
ATION IN A VICTORIAN MOUNTAIN
IMENT,
rne and Metropolitan Board of Works
lia).
nary bibliographic entry see Field 4C.
447

FLUENCE OF LAND USE ON STREAM
TY IN THE MANJIMUP AREA,
RN AUSTRALIA.
nary bibliographic entry see Field 4C.
452

ATION OF HEAT DISTRIBUTION IN A
CAROLINA RESERVOIR RECEIVING
D WATER,
h River Ecology Lab., Aiken, S.C.
ewis, Jr.
mal Ecology, CONF-730505, Proceedings
posium held at Augusta, Georgia May 3-5,
-27, 11 fig, 4 tab, 12 ref, append. USAEC
)-310.

ors: *Thermal pollution, *Water pollution
*Heterogeneity, *Thermal stratification,
ution, Heat, Discharge(Water), Heated
Epilimnion, Hypolimnion, *South
, Reservoirs, Path of pollutants.

ture data from a thermally polluted lake
cted and studied in terms of the total heat
f surface area in excess of a specific base
ure, the mean temperature of the upper
olumn, and an index of thermal
neity. An algorithm is provided for calcu-
se indexes from any verticle profile. Heat
on in a reservoir is illustrated using the
of excess heat, mean epilimnetic tem-
and thermal heteogeneity. Heat is
lly distributed near the discharge with
at being largely confined to a surface
n at the discharge point. Studies of heat
on showed that total heat above the base
e much lower near the discharge than at
nts in the lake due to internal seiches and
f variations in wind exposure but ther-
ogeneity was always highest near the
point. Effects of natural solar warming,
erruption of heat flow, and other factors
studied. During the early spring, extraor-
polimnetic warming of the lake occurs.
tributed to the addition of waste heat.
W76-02004) (Chilton-HNL)
3

TEMPERATURE EFFECTS ON THE SORPTION OF RADIONUCLIDES BY AQUATIC ORGANISMS.
Du Pont de Nemours (E. I.) and Co., Aiken, S.C.; and Savannah River Ecology Lab., Aiken, S.C.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusts, Georgia May 3-5, 1973. p 28-42, 6 fig, 6 tab, 18 ref. USAEC AT(07-2)-1.

Descriptors: *Thermal pollution, *Water pollution effects, *Radioisotopes, *Soration, *Water temperature, Aquatic animals, Aquatic algae, Cesium, Cobalt, Iron, Manganese, Strontium, Zinc, South Carolina.
Identifiers: Stigeoclonium lubricum, Navicula seminulum, Plectonema botyanum, Glyptotendipes paripes, Chironomus plumosus, Palaemonetes paludosus.

Green alge showed no significant changes in growth or sorption of Cs137, Sr85, Fe59, Co57 and Mn54 at water temperatures of 23 to 32 degrees C. At 32 degrees, C, growth of Navicula seminulum was inhibited and radionuclide concentrations were 2 to 5 times higher than at lower temperatures. At 40 degrees C, blue-green alga showed no significant change in the sorption of Cs137, Sr85, Zn65, and Fe59. Concentrations of Co57 in P. boryanum decreased with increased water temperature and concentrations of Mn54 increased from 25 to 35 degrees C. Midge larvae were relatively poor radionuclide concentrators. At temperatures of 20 to 31 degrees C, no significant change in radionuclide sorption was seen in larvae of Glyptotendipes paripes and Chironnus plumosus. A 12 degreec temperature differential had little effect on the sorption of Cs137, Sr85, and Zn65 by whole shrimp during the 21 day study. Sorption levels varied inversely with temperature but radionuclide concentrations in whole shrimp decreased by factors of less than 3 as water temperatures were raised from 20 to 32 degrees C. (See also W76-02004) (Chilton-HNL)
W76-03464

EFFECTS OF ACUTE EXPOSURE TO SUBLETHAL CONCENTRATIONS OF CADMIUM ON THE THERMAL RESISTANCE OF THE MUMMICHOG,
South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.; and South Carolina Univ., Columbia. Dept. of Biology.
C. L. McKenney, Jr., and J. M. Dean.
In: Thermal Ecology, CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973. p 43-53, 6 fig, 26 ref.

Descriptors: *Thermal pollution, *Water pollution effects, *Cadmium, *Fish, Resistance.
Identifiers: Sublethal concentrations, Acute exposure, Mummichogs, Fundulus heteroclitus.

Acute exposures to sublethal concentrations as low as 10% of the LD sub 50 value of cadmium reduced the thermal resistance of the mummichog, Fundulus heteroclitus, throughout its temperature range. At all test temperatures fish acclimated at 10, 20 and 30 degrees C and exposed to 56 mg of cadmium per liter for 24 hours had thermal resistance times significantly lower than those of control fish. Exposure to 28 and 14 mg of cadmium per liter for 24 hours affected thermal resistance of the fish as a function of acclimation temperature. A more striking reduction in thermal resistance was observed in those fish exposed to 20% of the LD sub 50 concentrations of cadmium for 24 hours and acclimated at 10 degrees C than those fish exposed to the same concentration of cadmium and acclimated at 30 degrees C. Exposure to 10% of the LD sub 50 concentrations of cadmium for 24 hours had no significant effect on the thermal resistance of mummichogs acclimated at 30 degrees C and reduced the median resistance times of mummichogs acclimated at 10 degrees C to a greater extent than it did those of the fish acclimated at 20 degrees C. (See W76-02004) (Chilton-HNL)
W76-03465

SATURATION VALUES OF DISSOLVED GASES ASSOCIATED WITH THE OCCURRENCE OF GAS-BUBBLE DISEASE IN FISH IN A HEATED EFFLUENT,
Duke Power Co., Charlotte, N.C.
W. D. Adair, and J. J. Hains.
In: Thermal Ecology, CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973. p 59-78, 3 fig, 7 tab, 18 ref.

Descriptors: *Thermal pollution, *Water pollution effects, *Nitrogen, *Oxygen, *Supersaturation, Fish Diseases, Fish, Temperature, Effluents, Discharge(Water), Flow, Depth, North Carolina.
Identifiers: *Gas-bubble disease.

A study of the concentrations and the corresponding dissolved-oxygen and -nitrogen saturation values associated with the heated effluents from three Duke Power Company steam stations was undertaken after the discovery of gas-bubble disease in fish inhibiting a cove that received heat effluent from one of the stations (Marshall Steam Station). An evaluation of plant operating data showed that the responsibility for the peak incidence of gas-bubble disease in the winter of 1970-1971 was apparently due to a combination of high temperature (resulting in a high degree of supersaturation), plant flow, and depth of discharge outlet. At Marshall the nitrogen supersaturation was highest at the point of discharge and decreased to near-control (or below 110%) levels at a station 3.0 km downstream. Withdrawing water under the skimmer wall did not result in higher than control saturation values at the plant intake structure. (See W76-02004) (Chilton-HNL)
W76-03466

EFFECTS OF THERMAL EFFLUENT ON THE FAT CONTENT OF THE MOSQUITO FISH,
Savannah River Ecology Lab., Aiken, S.C.
J. D. Falke, and M. H. Smith.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 100-108, 1 tab, 36 ref. AT(38-1)-310 and AT(38-1)-708 NSF GY-9838.

Descriptors: *Thermal pollution, *Water pollution effects, *Fish, *Food habits, Habitats, South Carolina.
Identifiers: *Fat, *Mosquito fish, Gambusia affinis, Eurythermal species.

Mosquito fish were collected at the Savannah River Plant from seven locations (three areas receiving thermal effluent, one thermal recovery area, and three natural areas) for the purpose of investigating the possible relationships between environmental temperature and fat content of the species. Percentage of fat in each fish was determined and correlated with the log of the dry weight. Females had significantly more fat than males at all locations except one, which had never received thermal effluent. The amount of body fat was found to be a function of the type, quality and amount of energy producing food ingested and assimilated by the fish and did not vary as a function of habitat temperature. (See also W76-02004) (Chilton-HNL)
W76-03467

EFFECTS OF ACUTE COLD SHOCK ON THE CHANNEL CATFISH,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
R. M. Block.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 109-118, 5 fig, 17 ref. AT(45-1)-2042 and AT(45-1)1830.

Descriptors: *Thermal pollution, *Water pollution effects, Channel catfish, Chlorides, Cold resistance.

Identifiers: *Plasma osmolarity, *Glucose, *Cold shock, Chloride ions, Acclimation, Hematocrit.

Channel catfish were acclimated at 30 degrees C and exposed to acute cold shock at 10 degrees C. During the first ten minutes of exposure a slight increase in plasma osmolarity and chloride ions were indicated. There was a rapid decline in osmolarity and chloride concomitant with increased plasma glucose and tissue water after a 24 hour period. After 45 hours of exposure to 10 degrees C, plasma osmolarity decreased 34%, chloride decreased 55% and glucose levels increased 28.1%. The plasma concentrations of glucose, chloride, and osmolarity returned to normal over a four day period when the fish were returned to acclimation temperature. (See also W76-02004) (Chilton-HNL)
W76-03468

BODY-TEMPERATURE CHARACTERISTICS OF FISH AT A THERMAL DISCHARGE ON LAKE MICHIGAN,
Argonne National Lab., Ill.
S. A. Spigarelli, G. P. Romberg, W. Prepejchal, and M. M. Thommes.
In: Thermal Ecology, CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973. p 119-132, 4 tab, 3 fig, 15 ref.

Descriptors: *Thermal pollution, *Water pollution effects, *Fish, *Thermal capacity, *Heat transfer, Carp, Trout, Temperature, Stabilization, Discharge, Flumes, *Lake Michigan.
Identifiers: *Equilibration rates, *Body temperature, Chub, Alewives, Coregonus sp., Aloso pseudoharengus.

The rate of change and the time for stabilization of body temperature for five species of Lake Michigan fish experimentally exposed to elevated or reduced temperatures were monitored. The heat-exchange half-times of fish exposed to temperature changes of 4 to 9 degrees C differed greatly between species and were generally proportional to body weight. The internal temperature of trout, chubs, and alewives weighing less than 100 grams required less than 10 minutes total stabilization time while carp weighing approximately 4000 grams required 1 to 2.5 hours total stabilization time. Alewives exposed to both elevated and reduced temperatures required a longer time for cooling than warming. Derived heat-exchange half-times are used to calculate the short-term residence times of fish collected from warm discharge waters. In both elevated- and reduced-temperature experiments, final body temperature of the fish stabilized at a higher temperature than that of the exposure medium. Body temperature measurements made on fish collected from the discharge area reflect substantial behavioral thermoregulation. (See also W76-02004) (Chilton-HNL)
W76-03469

EFFECT OF THERMAL STRESS ON DRAGONFLY NYMPHS,
Birmingham-Southern Coll., Ala.
W. J. Martin, and J. B. Gentry.
In: Thermal Ecology, CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973. p 133-145, 2 tab, 4 fig, 31 ref. AT(38-1)-310 and AT(38-1)-708.

Descriptors: *Thermal Tollution, *Water pollution effects, *Dragonflies, Lethal limit.
Identifiers: *Critical *Thermal maximum, Lethal temperaure, *Nymphs, Odonata, Libellula.

Dragonfly nymphs of the genus Libellula were collected from a thermally stressed stream and a control stream and tested for critical thermal maximum (CTM) and lethal temperature (LT). Nymphs were separated into groups and each group was acclimated to a specific temperature (15, 20, 25, 30, or 35 degrees C) and maintained at this acclimation temperature for 24 hours before being tested. Winter water temperatures in the thermal stream ranged from 30 to 33 degrees C and in the control stream from 5 to 12 degrees C. Correlations were found between CTM, LT, and body length at the different acclimation temperatures. The LT for nymphs acclimated at 15 degrees C from the thermal stream was 43.8 degrees C and it increased at a constant rate to 47.7 degrees C for the nymphs acclimated at 30 degrees C, but there was no significant increase for the 35 degree C group. For nymphs from the control stream, the LT of the 15 degree C group was 42.8 degrees C; it declined to 42.1 degrees C for the 25 degree C group and then increased to 45.5 degrees C for the 35 degree C group. Nymphs from the thermal stream were larger than those from the control stream. (See also W76-02004) (Chilton-HNL)
W76-03470

RESISTANCE OF CRAYFISH TO ACUTE THERMAL SHOCK: PRELIMINARY STUDIES,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
C. D. Becker, and R. G. Genoway.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 146-150, 1 fig, 8 ref. AT(45-1)-1830.

Descriptors: *Thermal pollution, *Water pollution effects, *Heat resistance, *Lethal limit, Crayfish, Heat resistance, Temperature.
Identifiers: *Thermal shock, Pacifastacus leniusculus.

Laboratory studies were conducted to determine the resistance of crayfish to acute thermal shock after acclimation at 10, 20, and 30 degrees C. The tolerance of the crayfish to temperature rise declined rapidly at increasing acclimation levels. The crayfish survived exposures for 48 hours to elevated temperatures up to about temperature rise of 19 degrees C when acclimated at 10 degrees C, a temperature rise of about 10 degrees C when acclimated at 20 degrees C, and temperature rise of only 1 to 2 degrees C when acclimated at 30 degrees C. (See also W76-02004) (Chilton-HNL)
W76-03471

CHRONIC MALNUTRITION IN FOUR SPECIES OF SUNFISH IN A THERMALLY-LOADED IMPOUNDMENT,
North Carolina Univ., at Asheville. Dept. of Biology.
T. P. Graham.
In: Thermal Ecology, CONF-730505, Proceedings of a Symposium held at Augusta, Georgia May 3-5, 1973. p 151-157, 1 fig, 2 tab, 18 ref. NSF GY-9129 AT-38-1-(310).

Descriptors: *Thermal pollution, *Water pollution effects, *Metabolism, *Food abundance, Sunfishes, *North Carolina, Impoundments, Heated water, Heat resistance.
Identifiers: *Malnutrition, *Starvation, Lepomis, *Lake Julian(NC).

Fish from a thermally stressed section of Lake Julian in North Carolina were found to be congregating in spring fed coves and to be suffering from chronic malnutrition while those from the non-thermally stressed section of the impoundment were not suffering from malnutrition. It was suggested that fish from the thermally stressed section left for cooler waters in early summer with some fish entering spring cooled coves having initially a good food supply. Rising water temperatures prevented the fish from leaving the coves as the food supply dwindled so that a large proportion were stranded to starve. As starvation became more pronounced, the fishes ability to successfullly leave for cooler waters became more diminished because of increased metabolic stress at higher temperatures. (See also W76-02004) (Chilton-HNL)
W76-03472

EFFECTS OF THREE HEATING RATES THE CRITICAL THERMAL MAXIMUM BLUEGILL,
Oak Ridge National Lab., Tenn. Environme Sciences Div.
D. K. Cox.
In: Thermal Ecology, CONF-730505, Proceed of a symposium held at Augusta, Georgia May 1973. p 158-163, 2 tab, 11 ref.

Descriptors: *Thermal pollution, *Water poll effects, *Heating, *Rates, Fish, Temperature sistance, *Sunfishes.
Identifiers: *Critical thermal maximum, Lep macrochirus, Acclimation.

Critical thermal maximum was used to deter if bluegill acclimated to a particular temper exhibit significantly different levels of the tolerance when they are subjected to diff constant rates of temperature elevation. The were acclimated to 26 degrees C for a minimu 14 days and subjected to temperature elev rates of 0.1, 0.5, and 1.0 degrees C per mi Temperatures at which loss of equilibrium cessation of opercular beating occurred chosen as end points. Slower rates of he produced lower mean end-point tempera Large bluegill subjected to heating rates of 0.1 degrees C per minute lost equilibrium s but maintained opercular beating longer than fish. Higher mean end-point temperatures achieved at the faster rates of heating becau dying rate did not keep pace with the rapid h of the external media. (See also W76-((Chilton-HNL)
W76-03473

RELATIVE SENSITIVITY OF DIFFE DEVELOPMENTAL STAGES OF CARP TO THERMAL SHOCK,
Oak Ridge National Lab., Tenn. Environ Sciences Div.
M. L. Frank.
In: Thermal Ecology, CONF-730505, Proce of a symposium held at Augusta, Georgia M 1973. p 171-176, 2 tab, 6 ref.

Descriptors: *Thermal pollution, *Water po effects, *Thermal stress, *Embryonic stage, Damages, *Carp, Fish eggs.

The effects of acute thermal shock on the de ment of carp eggs with particular emphasis relationship between thermal sensitivity an stage of development was investigated. eggs were maintained at 25 degrees C and mental groups of eggs were exposed to ten tures of 35, 37.5, 40, 42.5, and 45 degrees C minute periods. Eggs exposed to 42.5 degrees C did not develop. The response exposed at other experimental temperatu pended upon their stage of development time of thermal shock. The thermal limit fo fertilized eggs was approximately 35 deg and for embryos in late stages of develo between 40 and 42.5 degrees C. The egg more susceptible to thermal damage cleavage and blastopore-closing stages tha other stage. (See also W76-02004) (Chilton-W76-03474

PRELIMINARY STUDIES ON THE EFFE FATIGUE ON THERMAL TOLERAN RAINBOW TROUT,
Battelle Pacific Northwest Labs., Richland
M. J. Schneider, R. G. Genoway, and S. A. Barraclough.
In: Thermal Ecology, CONF-730505, Proc of a Symposium held at Augusta, Georgia 5, 1973, p 177-185, 2 fig, 2 tab, 8 ref.

Descriptors: *Thermal pollution, *Water effect, *Thermal stress, Resistance, * trout, Temperature.
Identifiers: *Fatigue, *Blood, *Lactic ac cose, Cold shock, Immobilization.

centrations of blood lactic acid and blood glu-
in a fish in a resting state served as a base-line
surement for comparisons of the combined ef-
of temperature and fatigue. Cold shock was
as a means of immobilization. Rainbow trout
exposed to elevated water temperature (27
es C) for 3 min and returned to acclimation
erature (4.3 degrees C). Blood samples were
ned at the end of the exposure time and at 5
intervals for a period of 1 hour. The time of
arance of lactic acid and glucose showed large
ations in concentrations. (See also W76-
) (Chilton-HNL)
03475

PONSES OF PLANKTONIC
OCERANS TO HEATED WATERS,
ell Univ., Ithaca, N. Y. Dept. of Natural
arces.
Carlson.
ermal Ecology, CONF-730505, Proceedings
ymposium held at Augusta, Georgia May 3-5,
p 186-206, 7 fig, 4 tab, 18 ref.

iptors: *Thermal pollution, *Water pollution
s, *Zooplankton, *Heat resistance,
gical communities, Plankton, Aquatic popu-
s, Bioassay, Crustaceans, Mortality, New
outh Carolina.
fiers: *Cladocerans, Scapholeberis kingi,
nation temperatures.

ations of pond zooplankton were reared and
d at elevated temperatures. The plankton
nded to heat through changes in turnover
hanges in species composition, and mortali-
the five communities reared outdoors for 35
treatment at mean temperature of 25 degrees
4.8 degrees C above the ambient water tem-
re, had the greatest crustacean diversity and
y. Reduction in community density was seen
5 degrees C above ambient and at 20.8
es C above ambient, 100% mortality oc-
within 6 days. The upper thermal limits of
oleberis kingi were studied in populations
a pond in Ithaca, New York and from a
pond near Aiken, South Carolina. Different
g rates and different acclimation tempera-
resulted in only minor differences in esti-
thermal resistance. Though there was no
e difference in the upper limit of the zone of
l tolerance for the New York and South
na populations, there was an extended sur-
ime of some of the South Carolina animals.
so W76-02004) (Chilton-HNL)
3476

CTS OF THERMAL EFFLUENT ON THE
LATION DYNAMICS OF HELMINTH
SITES IN LARGEMOUTH BASS,
ah River Ecology Lab., Aiken, S. C.
Cure, and G. W. Esch.
ermal Ecology, CONF-730505, Proceedings
mposium held at Augusta, Georgia May 3-5,
207-215, 4 fig, 3 tab, 16 ref. USAEC AT(38-

otors: *Thermal pollution, *Water pollution
, *Fish parasite, *Seasonal, *Heated water,
tion, Water temperature, Worms, Bass, In-
, Nematodes, Trematodes, South Carolina.
ers: *Micropterus salmoides,
hocephalan, Neoechinorhynchus cylin-
Tapeworm.

cycling of incidence and intensity of infec-
largemouth bass by helminth parasites in a
aving temperature regimes which ranged
ormal to greater than 10 degrees C above
was studied. The parasites exhibited a
seasonal change in intensity of infection
in incidence of infection with the pattern
nost apparent for the acanthocephalan,
inorhynchus cylindratus. Levels of infec-
the tapeworm, nematode, and trematode
ons were lower than those of the
acanthocephalan populations. Relatively reduced parasite loads appeared in all fish from June through October with maximum worm loads appearing in December through March. The number of parasites per host was higher in fish taken from areas with elevated water temperatures. Worm burdens were higher in female hosts than in males. (See also W76-02004) (Chilton-HNL)
W76-03477

THERMAL REGIME ALTERATION AND VITAL ENVIRONMENTAL PHYSIOLOGICAL SIGNALS IN AQUATIC ORGANISMS,
Saskatchewan Univ., Saskatoon. Dept. of Biology.
D. M. Lehmkuhl.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia, May 3-5, 1973. p 216-222, 4 fig, 12 ref.

Descriptors: *Thermal pollution, *Water pollution effects, *Physiological ecology, *Life cycles, Life history studies, Temperature, Thermal stratification, Growth stages, Growth rates, Food chains, Mayflies, Reproduction, Seasonal, Aquatic animals.
Identifiers: *Ephemeroptera.

Life-cycle and reproductive data of some species of Ephemeroptera are examined to demonstrate the dependence of the insects upon key temperatures to initiate embryological development, signal eclosion from the egg, control the rate of growth, and stimulate emergence of adults. Lack of or abnormal timing or signals, as a result of a reservoir, exterminated most of the intermediate members of a food chain up to 70 miles downstream from the reservoir. (See also W76-02004) (Chilton-HNL)
W76-03478

EFFECTS OF THERMAL EFFLUENT ON POPULATIONS OF MOSQUITO FISH,
Savannah River Ecology Lab., Aiken, S.C.
M. C. Ferens, and T. M. Murphy, Jr.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 237-245, 1 tab, 2 fig, 14 ref. AT(38-1)-310 and AT(38-1)-708.

Descriptors: *Thermal pollution, *Water pollution effects, *Fish populations, *Size, *Reproduction, Sexual maturity, Secondary productivity, Water temperature, Fish.
Identifiers: *Gambusia affinis, *Mosquito fish, Embryos.

Populations of mosquito fish from environments with different thermal conditions were examined to determine reproduction, sex ratios, and size structure. Fish were collected over a short period (from February 20 to March 3, 1973) to minimize seasonal effects on the breeding cycle. Water temperatures at the time of sampling ranged from 16.5 degrees C in a pond receiving no thermal effluent to 44 degrees C in a heated pond. Sex ratios varied from 0.24 (males) to 4.40 (females) but did not appear to vary with water temperature. The percentage of females 30 mm or more in length bearing eyed embryos increased linearly with water temperature. Size structure was also altered with increasing water temperature. The most significant difference in populations inhabitating nonheated and heated waters was the increased secondary productivity in heated areas. (See also W76-02004) (Chilton-HNL)
W76-03479

GROWTH AND CONDITION OF JUVENILE LARGEMOUTH BASS FROM A RESERVOIR RECEIVING THERMAL EFFLUENT,
Savannah River Ecology Lab., Aiken, S. C.
D. H. Bennett, and J. W. Gibbons.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973. p 246-254, 2 fig, 2 tab, 12 ref. USAEC AT(38-1)-310.

Descriptors: *Thermal pollution, *Water pollution effects, *Juvenile fish, *Growth rates, Bass, Water temperature, South Carolina.
Identifiers: *Body condition, *Micropterus salmoides.

Juvenile largemouth bass were collected from a reservoir near Aiken, South Carolina which receives thermal effluent from a nuclear reactor at weekly intervals from May through October in 1969 and from April through September in 1970. Mean surface temperatures in a cove receiving thermal effluent were greater than temperatures in nonheated areas by 7 degrees C in 1969 and 3 degrees C in 1970. Juvenile bass collected at the heated station grew faster than young bass of similar age living in nonheated-area temperatures. Condition factors of bass from heated and nonheated areas were generally similar except during May and July 1969 and June 1970 when condition factors were higher in bass from the heatd station. (See also W76-02004) (Chilton-HNL)
W76-03480

BIOCHEMICAL GENETICS OF SUNFISH III. GENETIC SUBDIVISION OF FISH POPULATIONS INHABITATING HEATED WATERS,
Savannah River Ecology Lab., Aiken, S. C.
D. Yardley, J. C. Avise, J. W. Gibbons, and M. H. Smith.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 255-263. 1 fig, 2 tab, 19 ref. AT(38-1)-310 and AT(38-1)-708.

Descriptors: *Thermal pollution, *Water pollution effects, *Genetics, *Sunfishes, Heated water, Lentic environment, Lotic environment, Bass, South Carolina.
Identifiers: *Allele frequency, Mosquito fish.

About 20 loci were electrophoretically examined in largemouth bass, mosquito fish, and bluegill for evidence of genetic changes associated with their inhabitating waters receiving thermal effluent. Comparisons were made between populations in lentic and lotic waters receiving thermal effluent, in post thermal areas, and in natural areas. There were no clear effects of thermal effluent on allele or genotype frequency. There was significant regional genetic heterogeneity and two species showed significant differences in allele frequencies between lentic and lotic environments. (See also W76-02004) (Chilton-HNL)
W76-03481

ENHANCED GROWTH AND INCREASED BODY SIZE OF TURTLES LIVING IN THERMAL AND POST-THERMAL AQUATIC SYSTEMS,
Savannah River Ecology Lab., Aiken, S. C.
E. J. Christy, J. O. Farlow, J. E. Bourque, and J. W. Gibbons.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 277-284. 4 fig, 10 ref. AT(38-1)-310.

Descriptors: *Thermal pollution, *Water pollution effects, *Chemical wastes, *Growth rates, *Size, Environmental effects, Turtles, Aquatic environment.
Identifiers: *Chemical pollution, *Body size, Pseudemys scripta.

Yellow-bellied turtles from four types of habitat: (1) natural areas receiving no thermal effluent; (2) aquatic areas receiving heated effluents; (3) post-thermal recovery habitats; and (4) a chemically polluted pond were examined for population size structure and individual growth rates. In these thermally and chemically altered environments both the nutrient balance and the community structure had been altered. Turtles from the thermal and post-thermal areas attained larger body sizes than those from natural habitats. Turtles from the thermally and chemically affected areas

grew faster than those from natural areas. Post-thermal environments continued to reflect changes in growth rates and body sizes for as long as 9 years after the last thermal input. (See also W76-02004) (Chilton-HNL)
W76-03482

VERTICAL MOVEMENT OF ZOOPLANKTON IN RESPONSE TO HEATED WATER,
Oak Ridge National Lab., Oak Ridge, Tenn. Environmental Sciences Div.
C. W. Gehrs.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 285-290. 1 fig, 1 tab, 8 ref.

Descriptors: *Thermal pollution, *Water pollution effects, *Zooplankton, *Thermocline, *Movement, Laboratory tests, Productivity.
Identifiers: *Vertical movement, Diaptomus sanguineus, Daphnia parvula.

Laboratory tests on Diaptomus sanguineus and Daphnia parvula were conducted to study individuals vertical locomotory response to heated water. Two tests were conducted for each species, one with initial water temperature at 21 degrees C and one at 15 degrees C. The zooplankton were acclimated at initial temperature for a minimum of 14 days. In the test apparatus all animals were observed to move to a deeper level when the water temperature at which they resided was increased 2 degrees C. Investigators conclude that thermal discontinuity can act as a deterrent to the vertical movement of zooplankton, which could result in decreased productivity. (See also W76-02004) (Chilton-HNL)
W76-03483

DISTRIBUTION OF ALLIGATORS IN RESPONSE TO THERMAL GRADIENTS IN A REACTOR COOLING RESERVOIR,
Savannah River Ecology Lab., Aiken, S. C.
T. M. Murphy, Jr., and I. L. Brisbin, Jr.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 313-321. 1 tab, 3 fig, 13 ref. USAEC AT(38-1)-310.

Descriptors: *Thermal pollution, *Water pollution effects, *Seasonal, *Distribution, Census, South Carolina, *Animal behavior.
Identifiers: *Alligators, *Abundance index.

Seasonal fluctuations in the distribution of American alligators inhabitating heated and unheated portions of a reactor cooling reservoir, were investigated. Abundance indexes (calculated from 4 years of daylight head counts) conducted three times a month were combined with counts from 1 year of weekly night cruises. The mean annual alligator head-count index for the heated area was more than twice that for the unheated area. The seasonal fluctuation of the abundance indexes at each counting site was striking and the higher yearly mean of the heated area appeared to be due to increased values during the winter months in that area. The unheated area showed a tendency to peak during warmer months, but this tendency was not so pronounced as that observed in the heated area during colder months. Decreasing water temperatures in the fall appeared to stimulate movement of the animals throughout the reservoir. Animals that encountered warmer waters apparently restricted their movements to these heated areas. (See also W76-02004) (Chilton-HNL)
W76-03484

EFFECTS OF ABNORMAL TEMPERATURES ON ALGAL COMMUNITIES,
Academy of Natural Sciences of Philadelphia, Pa.
R. Patrick.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 335-349. 3 tab, 56 ref.

Descriptors: *Thermal pollution, *Water pollution effects, *Algae, Aquatic habitats, *Biological communities, Temperature, Heated water, Resistance, Phytoplankton, On-site investigations, Reviews.
Identifiers: *Algal communities, *Tolerance range, Literature review.

Field studies below the warm water discharges of power plants confirmed literature review information that diversity and biomass may be increased by small temperature increases but temperature shifts toward the upper limits of the tolerance range and beyond bring about a shift in species composition. Shock exposure to high temperatures or exposure extended for several hours can have adverse effects on algae. Even moderate increases accompanied by other stresses may have severe effects. Where the percentage of water entrained is relatively small compared to the total volume of water, effects on the phytoplankton may appear to be negligible due to the patchiness of the phytoplankton distribution, the mixing of the discharge water with the receiving water, and ecological variables. (See also W76-02004) (Chilton-HNL)
W76-03485

IMPACT OF PRODUCTION-REACTOR EFFLUENTS ON VEGETATION IN A SOUTHEASTERN SWAMP FOREST,
Savannah River Ecology Lab., Aiken, S.C.
R. R. Sharitz, J. W. Gibbons, and S. C. Gause.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 356-362. 2 fig, 1 tab, 6 ref. AT(38-1)-310 and AT(38-1)-708.

Descriptors: *Thermal pollution, *Water pollution effects, *Vegetation, *Temperature, *Sediments, *Swamps, *Flood damage, Silts, Ecosystems, Biological communities, Hardwood, South Carolina.
Identifiers: *Tree kill, Bald cypress, Tupelo gum.

The discharge of heated reactor effluents into streams entering the Savannah River Plant swamp has resulted in tree mortality throughout two-thirds of the swamp. In the deltas of the tributary streams, water temperatures may be as high as 25 degrees C above normal. The release of reactor effluents not only elevated the water temperatures in portions of the swamp but also raised the water level throughout much of the swamp. Portions of the stream deltas in which both extensive flooding and silt deposition occur comprise more than half the area of total tree kill. The studies include determination of the flooding and thermal tolerance levels of the various species, of the effects upon species composition and diversity, and of the alteration of the competitive interaction among the species. (See also W76-02004) (Chilton-HNL)
W76-03486

MANGROVE-ROOT COMMUNITIES IN A THERMALLY ALTERED AREA IN GUAYANILLA BAY, PUERTO RICO,
Puerto Rico Nuclear Center, Mayaguez.
S. Kolehmainen, T. Morgan, and R. Castro.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 371-390. 7 tab, 7 fig, 17 ref. USAEC AT-(40-1)-4070.

Descriptors: *Thermal pollution, *Water pollution effects, *Biological communities, *Biomass, Aquatic animals, Aquatic algae, *Mangrove swamps, *Heated water, Intertidal areas, Resistance, Invertebrates, *Puerto Rico, Crabs, Mussels, Bays.
Identifiers: Barnacles, Polychaetes, Sponges, Tree oysters, Bryzoans, Coelenterates, Echinoderms, Ascidians, *Guayanilla Bay(PR).

The species composition and biomass of organisms in mangrove-root communities reflected the effects of elevated temperatures in a therma loaded bay on the south coast of Puerto Rico. D ing the summer, the number of species varied fr 25 to 96 at different stations with water tempe tures ranging from 31 to 40 degrees C. In win less tolerant species migrated to the warmest tions where the temperature ranged from 33 to degrees C. Some more resistance species, l green algae, barnacles, a polychaete, a sponge mussel, and a bryozoan were found in temp tures above 37 degrees C. The least tempera tolerant groups were the macroalgae, coe terates, echinoderms, and ascidians. Organi living on the mangrove roots had a distinct vert zonation in both species distribution and biom A majority of the organisms were found just be the intertidal zone. (See also W76-02004) (Chil HNL)
W76-03487

WINTER FAUNA IN A THERMAL DISCHAR WITH OBSERVATIONS ON MACROBENTHOS SAMPLER,
Virginia Inst. for Scientific Research, Richmon
M. D. Dahlberg, and J. C. Conyers.
In: Thermal Ecology, CONF-730505, Proceed of a symposium held at Augusta, Georgia May 1973, p 414-422. 1 fig, 2 tab, 27 ref.

Descriptors: *Thermal pollution, *Water polh effects, *Sampling, *Benthic fauna, Heated w Invertebrates, Aquatic animals, *Virginia.
Identifiers: *James River(Va), Macroin tebrates.

The influence of a thermal discharge on the f in the James River, Virginia, and the effective of a benthic sampling device for monitoring f water macroinvertebrates were examined. plers, constructed of a barbecue basket conta cinder-block chips and conservation cloth, suspended in the water for 26 days during winter. The variety and abundance of benthi ganisms collected were greater than were fou bottom samples at the same stations. Numbe species and abundance of benthic macroi tebrates increased as average temperatur creased. Thermal discharges were shown potentially a source of enhancement of production because the relative availabili food is high in the plumes. Seventeen speci fish were more abundant in the plume than a bient-temperature stations. (See also W76-0 (Chilton-HNL)
W76-03488

HEAT INFLUENCES IN ESTUA ECOSYSTEMS,
North Carolina State Univ., Raleigh. De Zoology.
B. J. Copeland, R. W. Laney, and E. C. Pendl
In: Thermal Ecology, CONF-730505, Proce of a symposium held at Augusta, Georgia Ma 1973, p 423-437. 5 fig, 4 tab, 8 ref.

Descriptors: *Thermal pollution, *Water pol effects, *Estuarine environment, Ecosy Biomass, Algae, Aquatic life, Growth Heated water, Resistance, Salinity, Size.
Identifiers: *Critical thermal max *Photosynthesis/respiration ratios, *Acclim temperature, Food conversion, Assimilation cies.

Laboratory and field studies were conduc measure ecosystem structure and produ under controlled conditions. Thermal loadi regulated at 5 degrees C above ambient te ture. Higher biomass and photosy is/respiration ratios were apparent in the estuaries during spring but lower in summe no significant differences in the winter. Inv tions into the relationship of temperat growth, food conversion, and assimilatio ciency showed that growth and feeding effi were directly related to increases in tempe

critical thermal maximum of the croaker and enaeid shrimp was significantly related to ac- ation temperature with lesser effects as- ted with salinity, size and species. (See also 02004) (Chilton-HNL)
03489

ECT OF THERMAL STRESS ON TOPLANKTON PRODUCTIVITY IN CON- SER COOLING WATER,
n Carolina University. Dept. of Environmen- iences and Engineering.
Gurtz, and C. M. Weiss.
hermal Ecology, CONF-730505, Proceedings ymposium held at Augusta, Georgia May 3-5, p 490-507. 9 fig, 2 tab, 20 ref.

iptors: *Thermal pollution, *Water pollution s, *Productivity, *Phytoplankton, *Thermal , Cooling water, Condensers, Growth, synthesis, Temperature, *North Carolina.
fiers: *Lake Wylie(NC).

les of phytoplankton were collected before fter passage through a condenser at levels of rature rise of 5.6, 11.1 and 16.7 degrees C on tes. Productivity was measured at several in- s during the cooling period and a final deter- ion was made at the end of a 26 hour period. num inhibition of productivity occurred dur- e first 1 to 2 hours of cooling, and neither r inhibition nor recovery was observed dur- e remainder of the 26 hour cooling period. phytoplankton acclimated to low winter tem- res survived a greater sudden rise in tem- re and the subsequent period of thermal than did summer phytoplankton in the same See also W76-02004) (Chilton-HNL)
3490

LATION ECOLOGY OF PARASITES IN LES FROM THERMALLY ALTERED NATURAL AQUATIC COMMUNITIES,
nah River Ecology Lab., Aiken, S.C.
ourque, and G. W. Esch.
ermal Ecology, CONF-730505, Proceedings mposium held at Augusta, Georgia May 3-5, 551-561. 4 tab, 3 tab, 19 ref. AT(38-1)-310.

ptors: *Thermal pollution, *Water pollution , Population, *Animal parasites, gical communities, Turtle, Heated water, Swamps, Trematodes, Nematodes, Natu- ams, Ecology, South Carolina.
iers: Acanthocephalans, Pseudemys s. , Species diversity.

from natural, thermally altered, and post- l recovery ponds and river swamps were ed and compared in terms of percent in- e of parasitic infection, frequency distribu- the infection, and mean parasite burden. tent of parasitism in host populations varied different types of habitat as did the number sites per infected host. In natural areas, ne- s were prevalent in the populations from out the incidence and worm burden for ne- s was significantly lower in hot ponds and ed in heated river swamps. Trematodes ap- to be adversely affected in areas receiving effluent regardless of habitat type. The of Acanthocephala per host increased in ed habitats. (See also W76-02004) (Chilton-

491

T OF THERMAL EFFLUENTS FROM AR REACTORS ON SPECIES DIVERSI- AQUATIC INSECTS,
ah River Estuary Lab., Aiken, S. C.
owell, and J. B. Gentry.
rmal Ecology, CONF-730505, Proceedings posium held at Augusta, Georgia May 3-5, 562-571. 4 fig, 1 tab, 17 ref. AT(38-1)-310 38-1)-708.

Descriptors: *Thermal pollution, *Water pollution effects, *Aquatic insects, *Census, *Biological communities, Sampling, Estimating, Mayflies, Stoneflies, South Carolina.
Identifiers: *Species diversity, *Evenness, Ephemeropterans, Odonates, Plecopterans, Trichopterans.

Aquatic insects were collected from stations along the edge of thermal, post-thermal, and natural streams on the Savannah River Plant site near Aiken, South Carolina. The insects were compared according to species composition and diversity. Plecopterans, odonates, ephermeropterans and trichopterans showed a trend of increasing importance in both numbers of individuals and numbers of species from thermal to post-thermal to natural streams. In the natural stream aquatic insect associations are characterized by high diversity and high evenness. In the thermal stream the associations are characterized by low diversity estimates and low evenness estimates. The associations sampled in the post-thermal stream showed intermediate values of both diversity and evenness and indicated that the stream is in a successional stage. Species diversity and evenness estimates appeared to be reliable indicators of environmental stress. (See also W76-02004) (Chilton-HNL)
W76-03492

BIRD DIVERSITY AND THERMAL STRESS IN A CYPRESS SWAMP,
Savannah River Ecology Lab., Aiken, S. C.
D. O. Straney, L. A. Briese, and M. H. Smith.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at August, Georgia May 3-5, 1973, p 572-578. 3 tab, 9 ref. AT(38-1)-310 and AT(38-1)-708.

Descriptors: *Thermal pollution, *Water pollution effects, *Birds, *Vegetation, *Nesting cover, *Swamps, Foods, Heated water, Biological communities, Census, *Thermal stress, South Carolina.
Identifiers: *Species diversity.

The study documents the effect of thermal effluents on bird populations in a cypress swamp and the status of bird populations in a post-thermal recovery situation. Variances increase in thermally affected areas but thermal effluents decrease the means of diversity and evenness estimates for bird species in the cypress swamp. Increased numbers of woodpeckers, crows, and herons were found in the thermal swamp. Introduction of thermal effluents produced a large stand of dead trees that serve as nesting and feeding sites for woodpeckers. Small passerines common to the natural areas find limited perching and feeding sites in the sparse vegetation of thermally affected areas. (See also W76-02004) (Chilton-HNL)
W76-03493

ABUNDANCE AND DIVERSITY OF WATERFOWL INHABITING HEATED AND UNHEATED PORTIONS OF A REACTOR COOLING RESERVOIR,
Savannah River Ecology Lab., Aiken, S. C.
I. L. Brisbin, Jr.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 579-593. 5 fig, 3 tab, 22 ref. USAEC AT(38-1)-310.

Descriptors: *Thermal pollution, *Water pollution effects, *Resistance, *Waterfowl, Census, Heated water, Foods, Ducks, Reservoirs.
Identifiers: *Species diversity, *Thermal tolerance.

Census counts were made of waterfowl inhabiting both heated and unheated portions of a cooling reservoir receiving heated effluents from a nuclear production reactor. 99% of the birds were counted between the months of October and April. American coots made up over 66% of the identified species. Significant differences were observed in the numbers and species diversity of the waterfowl in the two areas with more birds and a greater species diversity being found in the unheated area. Observed differences in species diversity may be explained by differences in feeding ecology. Diving ducks showed a greater degree of thermal tolerance than dabbling ducks. The pied-billed brebes were counted in equal numbers in both the heated and the unheated areas and thus showed the greatest thermal tolerance of any species observed. (See also W76-02004) (Chilton-HNL)
W76-03494

MODELING THE EFFECTS OF TEMPERATURE CHANGES ON THE ECOLOGY OF THE GARTER SNAKE AND LEOPARD FROG,
Wisconsin Univ., Madison. Dept. of Zoology.
W. P. Porter, and C. R. Tracy.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 594-609. 2 tab, 10 fig, 28 ref. AT(11-1)-2270.

Descriptors: *Thermal pollution, *Water pollution effects, *Model studies, *Temperature, *Biomass, Reproduction, Maintenance, Predation, Seasonal, Food chain, Energy budget, *Snakes, *Frogs, Michigan, South Carolina.
Identifiers: Thamnophis sirtalis, Rana pipiens.

The study evaluates the consequences of climatic change, both natural and man-made, on populations of animals in ecosystems. Energy balances between the physical environment and a predator (the garter snake) and prey (the leopard frog) were used to compute daily and seasonal food requirements and activity times for northern and southern regions of the country. The overlap of daily and seasonal activity times of predator and prey and predator food requirements for the two regions are compared. It was concluded that the total biomass required for all needs requires only occasional predation and biomass for reproduction is about an order of magnitude higher than the biomass needed for maintenance. It was found that thermal modification might affect biomass requirements for ectotherm maintenance by as much as 50% and might alter birth or death rates, longevity, egg or larval survival, parasite loading, or time of prey abundance vs. time of predator reproduction. (See also W76-02004) (Chilton-HNL)
W76-03495

ENERGY COST-BENEFIT MODELS FOR EVALUATING THERMAL PLUMES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
H. T. Odum.
In: Thermal Ecology, CONF-730505, Proceedings of a symposium held at Augusta, Georgia May 3-5, 1973, p 628-648. 12 fig, 4 tab, 13 ref. AT(40-1)-4398.

Descriptors: *Thermal pollution, *Water pollution effects, *Cost-benefit ratios, *Model studies, Systems models, Productivity, Ecosystems, Heated water, Cooling towers, Adaptation.

Energy-circuit models, calculations and simulations are used to consider the work of thermal effluents. The potential energy content of heat flows in an estuary is calculated as an auxiliary energy source, and the role of elevated temperature is considered as affecting productivity and recycling. Energy circuit diagrams and simulations are given for Eyring's model, for Morowitz's order model having autocatalytic temperature action, and for a model with more complex nutrient and sewage recycle actions of temperature. The system's total productivity and useful power may increase as the temperature increases if the temperature rise is accompanied by increased resources with which to interact. Experience with microcosms and measurements at Crystal River, Florida bear out sug-

gestions from models that if the ecosystems are given time for self-designing adaptation, the power plants may have neutral or positive energy impacts on estuarine ecosystems. The negative energy impact of these alternatives may be much less than the energy cost caused by cooling towers. (See also W76-02004) (Chilton-HNL)
W76-03496

5D. Waste Treatment Processes

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER AND SOLIDS FROM DILUTE AQUEOUS SOLIDS,
Hanover Research Corp., East Hanover, N.J. (Assignee).
C. Greenfield, R. E. Casparian, and A. J. Bonanno.
U S Patent No 3,917,508, 8 p, 2 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 375, November 4, 1975.

Descriptors: *Patents, *Waste water treatment, *Waste treatment, Water pollution control, *Evaporation, *Condensation, Water purification, Distillation, *Solid wastes, Drying, Equipment, Waste treatment.

A process and apparatus for recovering clean water and essentially dry solids from dilute aqueous solids is described. A dilute stream of aqueous solids is concentrated by heat evaporation and the evaporated water is condensed and recovered. The concentrated aqueous solids are mixed with relatively non-volatile fluidizing oil and subjected to dehydration by heat evaporation. The steam formed in the dehydration step is used to supply heat for the concentration step. The solids are separated from the fluidizing oil and recovered in an essentially dry state while the fluidizing oil is recycled. If desired, a light, relatively volatile oil may be mixed with the dilute aqueous solids to prevent scaling and fouling in the concentration evaporator. This invention is characterized in that at least a portion of the heat energy of the steam formed by evaporation in the dehydration step is recovered as useful heat within the system. (Sinha-OEIS)
W76-03011

SEWAGE TREATMENT PLANT,
Davis Water and Waste Industries, Inc., Thomasville, Ga. (Assignee).
D. A. King.
U S Patent No 3,917,532, 3 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 382, November 4, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Anaerobic digestion, Water pollution control, Aeration, Sludge disposal, Equipment.

A sewage treatment plant has an outer curved wall and an inner curved settling tank wall defining an aeration section with the walls having a common center. Increased sewage capacity of the plant is facilitated in addition to providing adequate mixing of the sewage by air injected into the sewage. A curved intermediate wall located between the inner and outer walls in the aeration section have a common center. An air diffuser provides rolling of sewage in the aeration section, from the intermediate wall toward the outer wall and from the intermediate wall toward the inner wall. The intermediate wall and the inner wall prevent shortcircuiting of sewage from a plant influent to a settling tank influent. (Sinha-OEIS)
W76-03013

COMPOSITIONS FOR THE REMOVAL OF HYDROCARBON AND INDUSTRIAL WASTE BY BIOLOGICAL DEGRADATION,
Banque pour L'Expansion Industrielle 'Banexi', Paris (France). (assignee)
P. Fusey.
United States Patent 3,796,637. Issued March 12, 1974. Official Gazette of the United States Patent Office, Vol 920, No 2, p 470, March, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Patents, Biodegradation, Odor.

Compositions for the removal of polluting industrial effluents, particularly hydrocarbon wastes, have been patented. In order to promote the biological degradation of waste materials while avoiding foul smelling anaerobic fermentation, the compositions used contain from 10% to 40% by weight of an oxygenating compound such as a metal oxide or an alkali metal peroxide. The support, such as calcium carbonate, silica, or talc, is chosen on the basis of the pH of the waste material to be treated. Other materials may be added to the compositions, such as nutrient substances for promoting the growth of microorganisms, nitrogenous substances and/or oleophilic substances in the case of compositions for the treatment of hydrocarbons. (Murphy-FIRL)
W76-03059

PETROLEUM PROCESSING AQ. EFFLUENTS PURIFICATION,
A. D. Li, R. G. Norutdinov, and V. P. Tronov.
Soviet Patent SU 371173. Issued May 15, 1973. Soviet Inventions Illustrated, Vol V, No 3, p D2, February, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Oil industry, Suspended solids, Emulsions, Oil wastes, Oily water.
Identifiers: Refinery wastes.

A process was patented for the purification of petroleum processing waste waters. Emulsified petroleum products are removed from aqueous effluents by contracting them with degasified naphtha. Up to 98% purification is achieved, and additional settling is unnecessary. Contaminated water was passed through degasified naptha in a column (one m layer of naphtha) in the form of small stream (about 2 mm diameter) at a speed of 1.0-1.5 m/hour. The content of petroleum products in the aqueous effluent was reduced from 50-650 mg/liter to 5-8 mg/liter, and the content of suspended solids was reduced from 53-56 mg/liter to 30-47 mg/liter. (Murphy-FIRL)
W76-03060

ACID WASTES ARE LICKED.
Water and Wastes Engineering, Vol 11, No 3, p 16, March, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Mining, *Acid mine drainage, Sludge, Waste water disposal, Chemical precipitation, Metals, Patents.
Identifiers: Pickling wastes, Metal finishing wastes.

A possible solution to the problem disposal of acid mine drainage and steel mill waste waters from acid pickling operations has been developed by Bethlehem Steel's research department. This newly patented method consists of collecting precipitated metal compounds in the form of a dense, easily handled sludge containing 15% to 50% solids. A controlled portion of the high-density sludge formed during the process is recycled, then mixed with an alkali-water slurry in a reactor. The mixture, containing the waste water, is passed to a second reactor where the acidity is neutralized by the alkali-water slurry, and metal compounds are precipitated. A settling tank receives the neutralized mixture, and the precipitated metal compounds settle out to form the high-density sludge. Clear water is then decanted from the settling tank. (Murphy-FIRL)
W76-03062

STUDY ON WASTE WATER TREATME WITH CALCIUM SILICATES (I) ON T REMOVAL OF CD(-), PB(-), CR(-) SALTS, JAPANESE),
I. Tohyama, T. Ueda, T. Nakamura, and K. Komatsu.
Bulletin of the Government Industrial Rese Institute (Osaka), Vol 24, No 4, p 294- December, 1973. 3 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Indus wastes, *Heavy metals, *Chemical precipita Adsorption, Ion exchange, *Cadmium, *L *Chromium.
Identifiers: Calcium silicates.

Calcium silicates have been used successfull the removal of cadmium, lead and chromium in waste water. This study provided the follo results on the use of calcium silicates for h metals removal. The capturing capacities fo Pb and Cr salts were increased in the ord xonotlite, tobermorite and CSH(N). The capt capacity of CSH(N) (tobermorite gel, large su area) which was prepared under the conditio low temperature and short reaction time fo described metals was 99.99% (five gram CSH(N), 0.02 M solution of Cd and Pb and solution of Cr salts). It is assumed that this m is based on the precipitation of hydroxides a sorption such as chemical fixing, ion excha complexing action. (Murphy-FIRL)
W76-03065

REVERSE OSMOSIS TREATMENT OF R TROPLATING WASTES,
Abcor, Inc., Cambridge, Mass.
R. G. Donnelly, R. L. Goldsmith, K. J. McNu and M. Tan.
Plating, Vol 61, No 5, p 432-442, May, 1974. 12 tab, 8 ref.

Descriptors: *Waste water treatment, *Ind wastes, *Reverse osmosis, *Water *Recycling, Membrane processes, Closed duits, Membranes.
Identifiers: Zero discharge, *Electro wastes, Cellulose acetate membranes.

The reverse osmosis treatment of platin rinse waters was examined. Emphasis was on closed-loop operation with recycle of p water for rinsing, and return of plating ch concentrate to the bath. Three comm available membrane configurations were ated experimentally including tubular (c acetate membrane), spiral-wound (c acetate membrane), and hollow-fiber (pol membrane) configurations. Tests were co with nine different rinse waters prepared tion of actual plating baths. Advantages and tions of the reverse osmosis process and membranes and configurations were di (Murphy-FIRL)
W76-03066

ELECTROLYTIC DESTRUCTION OF NIDES.
French Patent FR 2190-743, Issued March French Patents Abstracts, Vol V, No 13 1974.

Descriptors: *Waste water treatment, *I wastes, *Patents, Chemical wastes, *Elec Anodes, Cathodes.
Identifiers: *Cyanides.

A method for the electrolytic destruction nides in waste water and industrial efflu patented. Waste water containing toxic cy treated by electrolytic oxidation at the an electrolytic cell; the non-toxic cyana formed by the anodic oxidation of the cya partly reduced at the cathode and cyan may reform. Destruction of the cyanide reduced. The cathode is polarized by the

of a high cathode current density which
lers the diffusion level of the cyanate ions
igible. The anodes positioned between
odes are staggered so that the electrolyte has
irculate in a zig-zag manner. The anodes con-
of perforated graphite or solid sheets of
nized Ti. The cathodes are made from sheets
i or Cu wires, fixed to a removable plastic
ie. The potential difference between the elec-
es is 2-10 volts; a cathodic current density
ter than 10 amps/sq dn is imposed. (Murphy-
L)
-03067

AROGRAPHIC DETERMINATION OF AR-
IC IN INDUSTRIAL AND DRAINAGE
TERS (POLYAROGRAFICHESKOE
EDELENIE MYSH'YAKA V PRO-
SHLENNYKH I STOCHNYKH VEDAKH),
primary bibliographic entry see Field 5A.
-03068

BLEMS OF PROTECTION OF THE EN-
ONMENT (WHEN OPERATING)
YLENE PLANTS,
nical Economy and Engineering Review, Vol
2, p 42-45, February, 1974. 1 fig.

riptors: *Waste water treatment, *Industrial
es, *Chemical wastes, Cooling water, Biologi-
treatment, Sedimentation, Neutralization,
r pollution sources.
ifiers: *Ethylene manufacturing plant wastes.

ndesirable outputs of a typical ethylene plant
iscussed. The main source of the highly con-
ated waste water is the blowdown of process
vaporizers. This water contains sulfur,
ne and iron ions as well as phenols, hydrogen
de and KMNO4. The condensate of the al-
respiration, MEA-stripping process, is fed
the sewer system. This water contains
carbons, phenols, sulfur ions, and HCN +
S. The blowdown of steam generators is also
to the sewage system, but is comparatively
. Condensate of the glycol-stripping process
o added to the waste water stream; this in-
s hydrocarbons, phenols, exhaust steam
ie (105 C), and glow residue (600 C). Blow-
of the cooling water system is highly varia-
d may be used to dilute the main waste water
n. Caustic soda is another pollution source
ay bring with it additional hydrocarbons and
ls. Decoking of furnaces and quenchers con-
es coke-like particulates to the waste water
n. Waste water from the bi-yearly regenera-
f the hydrogenati on reactors contains large
ities of heavy hydrocarbons and is a further
ion source. Boiler feed water is prepared by
g through ion exchange columns and filter
When these are recharged by acid treatment
cant salt concentrations are released.
ical oxidation will remove the largest part of
rmful dilute organic compounds by bacterial
olism. Upstream of this stage, sedimentation
d substances should be allowed and also the
g separation of oil drops and oil films.
lization and reduction of inorganic com-
s such as sulfides should also be performed
o the biological oxidation process. (Murphy-

3069

RATUS FOR AND A METHOD OF PURI-
G WASTE FLUID,
Didycz, and D. Glassman.
ian Patent 945,058, Issued April 9, 1974. The
Office Record, Vol 102, No 15, p 1264,
1974.

ptors: *Waste water treatment, *Industrial
, *Chemical wastes, *Patents, Pollution
ent, Air pollution.

A method and an apparatus for purifying waste fluid containing waste water and corrosive salts has been prepared. A substantially salt-free condensate is produced and used to quench coke. This eliminates the contamination of the atmosphere which would occur if the untreated waste fluid were used to quench coke. The process utilizes the waste steam for the useful purpose of reducing the air pollution by quenching coke with condensed industrial pure water. (Murphy-FIRL)
W76-03070

RESIDUAL CHLORINE: SOMETHING NEW TO WORRY ABOUT,
R. Baker, and S. Cole.
Industrial Water Engineering, Vol 11, No 2, p 10-18, March/April, 1974. 7 fig, 15 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Chlorine, Cooling water.
Identifiers: Residual chlorine content.

Until recently residual chlorine discharge was regarded as an innocuous practice. New regulations have now forced greater attention on the fate of such chlorine releases. As a result of experimentation, it appears likely that standards for the release of chlorine into receiving waters will follow one of four criteria. For those areas where chlorine treated wastes are continuously being discharged to receiving waters, the discharge rate should not exceed 0.01 mg/liter for the protection of insensitive species, or no more than 0.002 mg/liter if most aquatic organisms are to be protected. In areas receiving chlorine treated wastes only intermittently, the discharge rate will not be permitted to exceed 0.2 mg/liter for 2 hrs/day to protect hardy species or no more than 0.04 mg/liter for the same period per day if trout and salmon are to be maintained. Cooling water from power plants represents the largest source of intermittent chlorine containing discharge water. The method of reducing residual chlorine depends on the type of system, such as an open once-through system or a recirculating type. Some possible methods include: proper application and control of chlorine; diverting tower blowdown to a secondary use; withholding blowdown during a period based on predictable decay rate; and, chemical dechlorination (with sulfur dioxide). (Murphy-FIRL)
W76-03071

SEPARATION OF WASTE OIL-IN-WATER EMULSIONS.
Belgian Patent BE 807-972, Issued March 15, 1974. Derwent Belgian Patents Report, Vol V, No 15, p D1, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Emulsions, *Patents, Oily water, Separation techniques, Electrolytes, Boiling.
Identifiers: Metal rolling wastes.

A technique is described which has been patented for the separation of waste oil-in-water emulsions which contain non-ionic and anionic emulsifiers, such as emulsions from cold rolling processes. These spent emulsions are separated into a usable oil phase and waste water meeting the proper standards by the addition of an electrolyte of pH 4 to 9, followed by heating and boiling. This electrolyte is an aqueous solution of salts, preferably chlorides, of group I and II metals. During boiling, a small quantity of Fe or Al salt, preferably hydrated $FeSO_4$, is added and air is then blown through the emulsion. Boiling is continued until the emulsifiers are destroyed. A clear water layer is separated for disposal, and the oil may be reused in metal tempering. (Murphy-FIRL)
W76-03072

ONE PRIVATE PLANT TREATS OIL, CHEMICAL RESIDUES IN DENMARK,
P. Henriksen.
Solid Wastes Management, Vol 17, No 5, p 77-78, 139, May, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil wastes, *Chemical wastes, Waste disposal, Incineration, Solid wastes, Costs, *Treatment facilities, Europe.
Identifiers: *Denmark.

Waste oils and chemicals which occur in connection with industrial activity create a problem in handling, treatment, and disposal. In Denmark, where commercial life is a typified by small companies, all the municipalities have banded together to set up a central treatment facility. This facility, called Kommunekemi A/S, has the sole task of converting wastes oils and chemicals to a safely disposal form. Kommunekemi initially was a municipally-owned corporation and is now a privately operated firm under contract to the national government. The installation is located at Nyborg and materials arriving there are sorted into waste oils, solvent discards, refuse for incineration, and inorganic chemical debris, each for separate treatment. Fees collected by Kommunekemi for handling the pollutants have been deemed insufficient to cover operating costs. Studies are now underway to explore whether indirect subsidy from the Danish government would be appropriate. (Murphy-FIRL)
W76-03073

BIOLOGICAL TREATMENTS OF ACID AZO DYES BY MICROBIAL POPULATIONS IN ACTIVATED SLUDGE, (IN JAPANESE),
Gifu Univ., (Japan). Faculty of Engineering.
T. Ogawa, E. Idaka, K. Hirabayashi, and Y. Takase.
Journal of the Society of Fiber Science and Technology, Japan, Vol 30, No 4, p 55-61, April, 1974. 7 fig, 4 tab, 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Dyes, Activated sludge, Biochemical oxygen demand, Biodegradation, *Biological treatment.
Identifiers: *Azo acid dyes, Bioflocculation.

Decontamination of waste water from dye industries by the activated sludge process is normally low. Influences of the composition of various culture media on the decreases of acid azo dyes and the growth curve of microbes were investigated in order to improve the decontamination properties. The culture media was prepared from meat extract, peptone, glucose, and mineral salts. The dyes were acid azo dyes which contained mono- or disulfonic acid groups. Bioflocculation and not biodegradation was found to be the major factor in the decontamination. When the BOD and dye concentration of the culture medium were equal to the concentrations in actual dye wastes, the decrease of the dyes was too low to decontaminate. However, when culture media had a concentration about 20 times the BOD of usual seage, there was a large decrease in the dye concentration (ranging from 60 to 97%) observed for acid dyes containing the monosulfonic acid group and a small decrease for the dye containing the disulfonic acid group. A lower digestion ratio of the BOD of the media resulted from the addition of the dye to the culture medium. Microbes could be adapted to the culture medium containing the dye by repeated inoculation, thus improving decontamination. (Murphy-FIRL)
W76-03074

THE DEVELOPMENT OF 'MITSUI KNIT FLOW' TYPES ACTIVATED SLUDGE AERATION TANK (MITSUI HENRYUSHIKI KASSEI ODEIHO BAKKISO NO KAIHATSU),
K. Ono.
Mitsui Zosen Giho, (Mitsui Shipbuilding Technical Review), Vol 85, p 33-41, January, 1974. 24 fig, 3 tab, 1 photo.

Descriptors: *Waste water treatment, *Industrial wastes, Textiles, *Activated sludge, Design, Biochemical oxygen demand, Mixing, Aeration, Tanks.
Identifiers: *Rayon manufacturing wastes, *Aeration tanks, Mitsui Knit Flow aeration tank.

Two types of aeration tanks are generally used for the activated sludge process of waste water treatment. These are the usual rectangular aeration tanks which provide economical utilization of space and easy plant expansion and the less compact circular aeration tank (such as 'Mitsui-Lubeck') which has superior capacity at high BOD or COD loading. Described is a third type of tank under development which is rectangular but has a high capacity, equal to the Lubeck type tank. This 'Mitsui Knit Flow' rectangular aeration tank is compared by structure, flow pattern of the mixed liquor in the tank, mixing characteristics, and test results of its waste water treatment to the two previous tanks. Using waste water froma rayon factory, the treatment capacity of the 'Mitsui Knit Flow' tank was better than the usual rectangular tank and almost equal to the circular type. (Murphy-FIRL)
W76-03075

WATER REUSE AND RECYCLE IN D(C)EDED BLEACHING,
J. A. Histed, and F. M. A. Nicolle.
Pulp and Paper Magazine of Canada, Vol 75, No 5, p 69-74, May, 1974. 4 fig, 4 tab, 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, Water pollution control, Chemical oxygen demand, Biochemical oxygen demand, Dissolved solids, Color, *Water reuse, *Recycling.
Identifiers: Counter-current washing, Kraft bleaching effluents.

Countercurrent washing for pulp from the bleach stage of kraft mills is one proposed system of pollution abatement. Laboratory work on this method has indicated the effectiveness of this system. Effluents from the acidic and alkaline sewers of a bleachery using the DcEDED sequence to bleach can be reduced to 1685 U.S. gal/adbt by extensive chlorination filtrate recycling, and countercurrent washing. This method reduced the pollution load by 30% for COD, 40% for BOD5, 25% for dissolved solids, and 40% for color. The system may be used as a separate bleach plant effluent treatment or for bleach chemical recovery. (Murphy-FIRL)
W76-03076

POLLUTION CONTROLLED POLYSULFIDE RECOVERY PROCESS,
C. B. Fogman, H. W. Nelson, and U. Tsao.
Canadian Patent 948,376, Issued June 4, 1974. The Patent Office Record, Vol 102, No 23, p 7, June, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Patents, *Pulp wastes, Sulfides, Hydrogen sulfide, Sulfur compounds.
Identifiers: *Polysulfide paper pulping wastes.

A patent was granted for a chemical recovery process for a polysulfide paper pulping system. Pulp washing, after polysulfide digestion, is performed in an essentially oxygen-free environment to minimize the oxidation of NaSH. Stripping and carbonation processes are performed by passing flue gas through a stripping tower and a carbonating tower. Na2CO3 is converted to NaHCO3 and is stripped to release H2S. This H2S is then converted to sulfur by the use of a liquid catalyst and the formed sulfur is then mixed and reacted with Na2S to form sodium polysulfide. The polysulfide liquor and any remaining white liquor are returned to the digestor. Desulfurized liquor from the stripping operation is subjected to an oxidizing-decomposing operation which oxidizes residual sulfides and decomposes residual NaHCO3. The treated liquor then has a pH of about 12.5, due to the addition of make-up NaOH and recycled and separtely oxidized white liquor. The resultant mixture is evaporated to about 50% dry solids concentration. Sulfur compounds in vent gases and condensates from mill process units are recovered with units to reduce air and water pollution. (Murphy-FIRL)
W76-03077

CLARIFICATION OF BOOK-MILL EFFLUENT BY ENZYME-ALUM,
Kimberly-Clark Corp., Neenah, Wis. Research and Engineering Dept.
Y. C. Wu.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 100, No EE3, p 541-548, June, 1974. 5 fig, 2 tab, 8 ref, 2 append.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, Laboratory tests, Suspended solids, Biochemical oxygen demand, Enzymes, Coagulation.
Identifiers: Starch, Book-mill effluents, Alum.

The use of an integrated enzyme-alum coagulating system for improving book-mill effluent clarification is considered. Laboratory tests were conducted to evaluate the following: actual performance of suspended solids and BOD5 removals; effects of pH, enzyme reaction time and sample age on the efficiency of process operation; optimum dose of saccharifying enzyme for the existing Kimberly Mill effluent treatment; and, potential savings in treatment cost. Samples from book-mill effluent from the plant at Kimberly, Wisconsin were filtered through a fine screen and coagulated. Analytical methods yielded several conclusions. It was proven that amylase enzymes (alpha and beta forms) can effectively reduce the dispersing power of the starch, resulting in a low chemical requirement for solids separation from book-mill effluent. If the pH of the mill effluent was in the range of 4.5 to 6.5 and the enzyme reaction time was at least 10 minutes, overall performance of an integrated enzyme-alum coagulation system was not affected by these parameters. Reduction of 5 to 10 percent BOD removal was caused primarily by the enzyme addition. The treatment cost of an integral enzyme coagulant system was between $16.2/million gal and $33.7/million gal. Actual cost is dependent upon concentration of suspended solids and starch. For a 10 mgd mill effluent treatment system, an annual saving is conservatively estimated at $4000 as compared to alum along. (Murphy-FIRL)
W76-03078

WATER POLLUTION CONTROL IN THE ITALIAN STRAW PAPER INDUSTRY,
Balfour-Italia, Rome (Italy).
R. M. Bradley.
Water Pollution Control, Vol 23, No 2, p 214-223, 1974. 6 fig, 11 tab, 1 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Pilot plants, Activated sludge, Dewatering, Sludge treatment, Filters, *Pulp wastes.
Identifiers: Biofilters, *Straw paper industry, *Italy.

The straw industry in Italy faces increasing competition from wood-pulp products. An economic means of reducing the pollution load of the water discharged and treating the wastes is needed. Treatment trials at several pilot plants showed that the wastes from a straw paper mill which used almost no internal recirculation were treatable by a one-stage activated sludge system. However, no conclusive results could be drawn. Further studies are needed including: effects of different degrees of recirculation within paper mills; systems of fiber recovery; methods of sludge dewatering; improvements to the one-stage activated sludge process by controlling nutrient dosing; two-stage activated sludge processes to achieve higher quality effluents; and, biological filtration either alone or in conjunction with activated sludge systems. (Murphy-FIRL)
W76-03079

HEAVY METAL-COMPLEXING AGENTS.
French Patent FR 2190-494, Issued March 8, 1974. French Patents Abstracts, Vol V, No 13, p D5 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, *Patents, Mercury, Chromium, Lead, Cadmium, Copper, Iron.
Identifiers: Heavy metal complexing agents, Antimony.

A heavy metal-bonding agent is used for removing heavy metals (Hg, Pb, Cr, Cd, As, Cu, or Fe) from solutions or gases, such as industrial waste water. The bonding agent may be used as a powder or as shaped articles. It is prepared by reacting -NH- and/or a -NH2-containing resin with CS2 used in atmospheres to incorporate at least 0.1 weight percent CS2 into the resin at 0-90 C. The reaction should take place for 10 minutes to 5 hours in a solvent and in the presence of a base. Optimally, the product should be reacted with a base at 10-50 C for 10 minutes or longer. (Murphy-FIRL)
W76-03080

RELIEVING WATER CYCLES BY THE USE OF INDIVIDUAL BACKFLUSH FILTERS (ENTLASTUNG DER WASSERKREISLARAUFE DURCH RUECKSPUELBARE EINZELFILTER),
B. Gockel.
Wochenblatt fuer Papierfabrikation, Vol 102, No 7, p 258-259, April, 1974. 1 fig.

Descriptors: Pulp and paper industry, *Filters, *Waste water treatment, Pumps, Recycling, *Industrial wastes, Water reuse, *Pulp wastes.

The uses of Ronningen-Petter filters with backflush and snap fit gives easy mounting in pulp and paper mill closed water cycle. Slightly polluted spray water from papermaking machines like Venta-Nip presses is cleaned by such filters which are arranged in units of two or more for continuous operation in a closed water cycle. In addition, sealing water in vacuum pumps can be purified by means of Ronningen-Petter filters before being recycled in heat exchangers. (Takacs-FIRL)
W76-03081

PURIFICATION OF FOOD INDUSTRY GENERATED WASTEWATERS. TECHNICAL AND SCIENTIFIC ASPECTS OF THE ALTERNATIVE: INDIVIDUAL OR COLLECTIVE TREATMENT (EPURATION DES EAUX RESIDUAIRES DES INDUSTRIES ALIMENTAIRES. ASPECTS TECHNIQUES ET SCIENTIFIQUES DE L'ALTERNATIVE: TRAITMENT INDIVIDUEL OU COLLECTIF),
L. Boliy.
Het Ingenieursblad, Vol 43, No 9, p 277-278, 1

Descriptors: *Food processing industry, *Waste water treatment, (Industrial wastes, Biochemical oxygen demand, Chemical oxygen demand, Biological treatment, Biodegradation, Activated sludge.
Identifiers: Municipal-industrial wastes, Chemical treatment.

General problems in the purification of industrial waters generated by the food industry are surveyed. Food industry-generated waste waters have an average BOD level of 1,000 mg/l, a suspended matter content of 150-1,500 mg/l, and a COD/BOD ratio of 1.6 which indicates a good degradability. Such effluents are first

mechanical impurities and sand, after which flotation is usually applied. The decantation is iderably improved by the addition of lime, inum sulfate, ferrous or ferric sulfate, or fer-hloride. Biological treatment is possible in ed lagoons that are sealed off to prevent ndwater contamination. Activated sludge ment in basins or treatment on percolation s are the feasible methods suitable for biolog-urification. (Takacs-FIRL)
-03082

USE OF ALCOHOL DISTILLERY-ERATED WASTE WATERS FOR IRRIGA-I (ISPOL' ZOVANIYE STOKOV SPIR-AVODOV DLYA OROSHENIYA),
Khruslova.
tekhnika i Melioratsiya, Vol 194, No 3, p 94-974. 2 tab, 4 ref.

riptors: *Food processing industry, *Water , *Recycling, *Waste disposal, Waste water nent, Irrigation, Effluents.
ifiers: Alcohol distilleries, Land treatment.

riences gained in experiments on the possible f effluents generated by alcohol distilleries igation of farmlands are presented. Effluents alcohol distilleries can be used for irrigation settling and pH adjustment to 6.5-7.5. The ef-s should be mixed with fresh water in a ratio least 1:4 to limit the total mineral content to g/liter. Distillery effluent should be used for ion at expenditures not higher than 500 cu The accumulation of chlorine in the soil dur-igation may lead to a slight temporary in-in the chloride salt concentration. This is, ver, easily neutralized by the fall rains. In ad-, the use of sulfuric acid in the technological ss eliminates this problem. (Takacs-FIRL)
-03083

RIENCE WITH THE USE OF OCOCCUS ALGAE FOR THE PURIFICA-OF WASTE WATERS GENERATED IN CH PRODUCTION (OPYT PRIMENENIYA OKOKKOVYKH VODOROSLEY DLYA STKI STOCHNYKH VOD KRAKHMAL O PROIZVODSTVA),
iorbacheva, and A. A. Prokopenho.
rnaya Promyshlennost', No 5, p 66-67, 1974.

ptors: *Food processing industry, *Waste al, *Chlorella, Effluents, Biochemical ox-emand, Chemical oxygen demand, *Waste reatment, Algae, Odor, Water purification.
iers: Starch mill effluents.

ficiency of Chlorella, a common algae, in ification of effluents from a starch mill was in percolation fields. The experiment over 50 considerable reduction in the BOD OD levels were noted. The water became nd odorless, and by the end of the 50-day nent, the Chlorella population was reduced to that of the BOD and COD contents. The cy of the treatment, expressed in terms of eduction, ranged from 89.7 to 95.2%, cor-ding to BOD reductions from 875-1,480 mg iter to 45-92.5 mg 02 per liter. Chlorella was icient in effluents with reduced pH values. -FIRL)
084

NATIVE PROBLEM: COMMUNAL OR DUAL PURIFICATION OF THE WASTE-RS GENERATED BY THE BIOLOGICAL TRIES IN THE LOUVAIN AREA LEMMSTELLING VAN HET ALTER-: GEMEENSCHAPPELIJKE OF IN-ALE ZUIVERING VAN HET AFAVL-I VAN DE BIO-INDUSTRIE ROND LEU-

bleeckere.
nieursblad, Vol 13, No 9, p 273-276, 1974.

Descriptors: *Food processing industry, *Waste water treatment, *Waste disposal, Effluents, Treatment facilities, Sewers, Biological treatment.
Identifiers: Louvain(France), Municipal-industrial wastes.

The alternative of communal or individual purification of waste waters generated in the food industry are discussed, based on examples from the United States and France. Conclusions are drawn for the food processing plants settled in the Louvain area. The examples from both the United States and France show clearly that food industries settled in or near communities tend to discharge their effluents into the municipal sewer systems after preliminary purification. Plants settled at a great distance from sewer systems purify their own waste waters, usually by a biological method, and often use the purified effluent for irrigation. The best solution for waste water purification for the particular food processing plants settled in the Louvain area was seen to be treatment in municipal waste water purification facilities. (Takacs-FIRL)
W76-03085

REMOVAL OF HEAVY METALS FROM LIQUID WASTE--CHELATE RESINS (HAISUICHU NO JUKINSOKU NO JOKYO--KIRETO JUSHI),
Y. Nanba.
Gijutsu to Kogai, (Technology and Public Nuisance), Vol 4, No 4, p 50-55, July 1974. 6 fig, 43 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, *Resins, Adsorption, Chelation.
Identifiers: *Chelating resins.

A method of removing heavy metals from liquid waste using chelate resins, and the properties of such resins are discussed. The mechanisms of neutralization coagulation settling of cadmium, zinc, chromium (+6), arsenic, lead, copper, and sulfides are detailed. Selective adsorption is a common property of various chelate resins, but it is affected by coexisting ions. Individual performance can be determined by testing equilibrium adsorption and the isothermal curve. Toxic metals from liquid wastes, as well as precious metals from plating waste water, can be recovered by this method. For these purposes, a resin packed tower is usually used. The pH affects adsorption. The optimum pH levels must be checked first, so that suspended substances are eliminated before adsorption. (Seigle-FIRL)
W76-03086

RESIDUE SEPARATION FROM WET ZINC OR COPPER EXTRACTION.
German Patent DS 2165-278. Issued June 6, 1974. German Patents Abstracts, Vol 5, No 24, p M2, July 19, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Heavy metals, *Zinc, *Copper, Mining, *Separation techniques.

A patent was issued for a process of residue separation from wet zinc or copper extraction. Effluents from zinc and copper treatment plants are continuously separated and washed. The solutions, which contain residues, are added to a container holding a flocculant or a hydrophobicising agent in excess. The residue is continuously separated from the hydrogen produced by reaction between excess acid and fine metalic particles. The residue is then thickened to agglomerates in a settling zone, which are washed by counter-current techniques. After a series of washings, the residue is combined with an equal amount of washing fluid, transferred to the collecting vessel, thickened, and removed. (Kramer-FIRL)
W76-03087

TREATMENT OF WASTE METAL PROCESSING SOLUTION SPILLAGE,
I. E. Wittmann.
Canadian Patent 949,240. Issued June 11, 1974. The Patent Office Record, Vol 102, No 24, p 93-94, June 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Patents, Liquid wastes.
Identifiers: Metal finishing wastes, Cyanide.

A patent was grated for a process for treating spillage and waste solutions from a line of metal finishing processing solution tanks. The method prevents the formation of toxic hydrogen cyanide gas by passing waste solution receiving and conditioning liquid along a floor catch basin. The conditioning liquid waste is collected in an end-positioned sump from a lower end of the catch basin. Sufficient capacity allows for safe treatment of the probable worst condition regarding the spillage of acid and cyanide solution from the processing line. (Kramer-FIRL)
W76-03088

LATEX WASTE AND TREATMENT,
East Bay Municipal Utility District, Oakland, Calif.
R. T. Williams.
Journal of Paint Technology, Vol 56, No 594, p 46-50, July, 1974. 5 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Municipal wastes, *Paints, Activated sludge, Lime, Suspended solids, Chemical oxygen demand.
Identifiers: Latex paint wastes, Combined municipal-industrial wastes, Alum.

Prior to the establishment of an industrial waste ordinance, the East Bay Municipal Utility District, in Oakland, California, performed a comprehensive investigation of industrial discharges. Results for latex paint washwater indicate that latex wastes are compatible with the municipal treatment plant. A combination of lime and alum treatment can remove 97.9 percent of the suspended solids and 70.1 percent of the chemical oxygen demand (COD). Activated sludge treatment removed 80.2 percent of the suspended solids and 66.5 percent of COD of one type of paint washwater. (Kramer-FIRL)
W76-03089

PROBLEMS OF WASTE WATER TREATMENT PLANT (PROBLEME EINER ZENTRAL-KLAERANLAGE),
W. Lutz.
Umweltschutz-Staedtereinigung, No 4, p 84-86, 1974. 2 fig, 3 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Anaerobic digestion, Fermentation, Odor, Sludge, Dairy industry, Food processing industry, Bacteria, *Treatment facilities.
Identifiers: Combined municipal-industrial wastes.

The causes of anaerobic fermentation that occured in a two-stage biological waste water treatment plant which was receiving both municipal and industrial effluents in Austria during its start-up period were studied. The sludge indices in the first and second biological stages were determined to be 207 and 315 mg/liter. Odor nuisances, lactic fermentation, and proliferation of Sphaerotilus were observed. The aerobic process was found to be inhibited by dairy effluents that had not been either neutralized or disinfected prior to discharge into the sewage system. The pH value of this effluent fluctuated between 4.5 and 11.5 due to the alternate use of sodium hydroxide and nitric acid as cleansers. In addition, the effluent had very high lactic acid bateria counts. Another effluent from a sauerkraut canning factory was susceptible to the proliferation of such bacteria. After installation of an automatic pH correction unit and chlorination

at an expenditure of 15-20 g chlorine per cu m, the waste water treatment plant resumed normal operation. (Tackacs-FIRL)
W76-03090

PHYSICAL-CHEMICAL TREATMENT OF WASTE EFFLUENTS FROM CANNING OF LEAFY GREEN VEGETABLES,
Georgia Univ., Experiment. Div. of Food Science.
W. A. Bough.
Journal of Milk Food Technology, Vol 37, No 4, p 205-208, 1974. 6 tab, 18 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Suspended solids, Turbidity, Polymers, Chemical oxygen demand, Flocculation, Activated carbon, Coagulation, Effluents.
Identifiers: *Physical-chemical treatment.

Physical-chemical methods of treatment are being increasingly applied to municipal and industrial wastes. Chemical methods of treatment applied to food processing wastes have most commonly employed inorganic salts such as lime, alum, or iron sulfate to coagulate suspended solids. The suspended solids in waste effluents from the canning of leafy green vegetables were effectively reduced by segregation and separate physical-chemical treatment of the unit wastes. Turbidity in the dunker washer effluent from spinach was reduced. Treatment consisted of adding 0.04 mg of an anionic polymer per liter of waste water at pH 4.0. The most concentrated effluent contained 11 percent of the total suspended solids load and 16 percent of the COD in only 1.3 percent of the waste water flow. A composite effluent from the canning of turnip greens and diced roots was treated with polymeric flocculating agents and activated carbon in a physical-chemical treatment system. The suspended solids concentration was reduced by 92 percent and the COD by 19 percent through flocculation and settling. (Kramer-FIRL)
W76-03091

WASTE WATER TREATMENT IN THE BEET-SUGAR INDUSTRY,
Raffinerie Tirlemontoise S.A., Tienen (Belgium). Research Dept.
L. Delvaux.
Sugar Technology Reviews, Vol 2, No 2 p 95-135, July, 1974. 10 fig, 2 tab, 233 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, *Sugar beets, Water reuse, Irrigation, Biological treatment, Reviews.

The increase of pollution in surface waters, the continuous increase in water needs, and the progressive strengthening of laws in highly industrialized countries are three central waste water problems of the sugar industry. The problems involved in settling, recycling and purification of the various water are reviewed as well as the quantities and the sugar-factory waters. An ideal scheme of water circuits which use no fresh water intake from the outside is examined, with discharge into the river of clean water of such a quality that no payment is required. The classical methods of treating waste waters, particularly flume and wash water, for purification before their discharge into a river or to enable their reuse are discussed. These are settling, irrigation and biological purification processes. Each sugar factory has its own problems in processing its waste waters; various solutions must be considered to choose the one appropriate to the circumstances of a given factory. (Kramer-FIRL)
W76-03092

TREATMENT OF WASTE WATERS FROM THE MEAT INDUSTRY,
M. C. Dart.
Process Biochemistry, Vol 9, No 5, p 11-14, June, 1974. 10 tab, 34 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Pre-treatment(Water), Flotation, Anaerobic digestion, Biological treatment, Activated sludge, Filtration.
Identifiers: *Slaughterhouse wastes, Percolating filters.

Waste waters from the food industries are generally not directly toxic to aquatic organisms and fish. However, they do contain organic material in suspension, colloidal suspension, and solution, which can stimulate the growth of the naturally occuring microorganisms present in all surface waters, thereby causing oxygen depletion and deterioration of the water quality. Solid particles in the effluent can settle out on the bed of the stream or river causing a build-up of sludge deposits which rapidly become anaerobic. The volume of effluent and the pollution load to be expected from slaughterhouse and meat-packing plants is defined. Methods of treatment which have been used successfully are outlined. These include process modification, pre-treatment, dissolved air flotation, chemical treatment, anaerobic and aerobic biological treatment, percolating filters, and activated sludge methods. (Kramer-FIRL)
W76-03093

THE TREATMENT OF WOOL-SCOURING EFFLUENT: CENTRIFUGATION STUDIES,
New South Wales Univ., Kensington. (Australia). School of Textile Technology.
J. R. McCracken, and M. Chaikin.
Journal of the Textile Institute, Vol 65, No 6, p 314-324, 1974. 3 fig, 4 tab, 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Centrifugation.
Identifiers: *Wool scouring wastes, Grease.

The recovery of grease with a centrifuge from a wool-scouring liquor that has not been excessively agitated depends primarily on the composition of the disperse-phase particles. The composition of those particles not capable of being separated in a centrifuge depends on the quantity and density of detergent used in scouring. Excessive agitation of the scouring liquor greatly reduces recovery and should be avoided. Higher recoveries of wool grease in a centrifuge will be realized with raw wools containing relatively low proportions of oxidized matter in the wool-grease constituent. (Kramer-FIRL)
W76-03094

TREATMENT AND DISPOSAL OF EFFLUENT FROM THE WOOL TEXTILE INDUSTRY,
R. Harker, and R. Bruce.
Textile Journal, Vol 49, No 3, p 30, 32, 34, 36, March, 1974. 4 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Centrifugation, Distillation, Water utilization, Dyes, Water consumption(Except Consumptive use), Waste water disposal.
Identifiers: *Wool scouring liquor, Grease, Vacuum filtration.

Investigations of several methods of effluent treatment from wool textiles have been conducted by Wira, the technical center for the United Kingdon wool textile industry. Topics included methods of treatment to produce effluents acceptable to river and local authorities and study of water usage. The two main treatment methods previously used were acid-cracking and centrifugation, which give grease recovery figures of 70% and 4-%, respectively. A small pilot plant was used to test vacuum filtration and distillation methods. It was concluded that the textile industry has a variety of liquors, and that some should be handled separately. In addition, new fibers, dyes, and methods of producing and finishing fabrics will lead to changes in the effluents produced. (Kramer-FIRL)
W76-03095

THE TREATMENT OF TEXTILE INDUSTR GENERATED EFFLUENTS AND ECONOMY O WATER CONSUMPTION (IL TRATTAMENT DI EFFLUENTI TEXXILI E L'ECONOMIA NI CONSUMI DI ACQUA). 21TINCTORIA, NO 2, 61-64, FEBRUARY, 1974. 1 TAB.

Descriptors: *Waste water treatment, *Industri wastes, *Textiles, Dyes, Filtration, Biologic treatment, Water reuse, Flocculation, Activat sludge, Biochemical oxygen demand, Chemic oxygen demand.
Identifiers: Vacuum filtration, Closed wa systems.

Reports by British Textile Research Institutes textile industry generated waste waters reviewed. Effluents generated by the textile ind try contain fibrous and nonfibrous materials, fa chemicals and dyes used in the product process. The collection and mixing of the differ effluents in textile plants facilities further purfi tion, while primary settling in not necessary. tration and biological treatment are used for clo water cycles. Chemical flocculation with s sequent vacuum filtration, and biological tr ment by the activated sludge method proved to highly efficient. The latter method efficiencies 80% and 67% in BOD and COD reduction, resp tively. (Tackacs-FIRL)
W76-03096

TECHNIQUES FOR DECOLORING M WASTEWATER,
Weston (Roy F.), Inc., West Chester, Pa.
M. L. Woldman.
Textile Chemist and Colorist, Vol 6, No 8, p 2 August, 1974. 7 tab.

Descriptors: *Waste water treatment, *Indus wastes, *Textiles, Dyes, Pre-treatment(Wa Biological treatment, Tertiary treatment, tivated carbon, *Color.
Identifiers: *Decolorization, Chemical treatm

Techniques for the removal of dyes in effl from textile mills are reviewed. On-site treat methods considered include pre-treatment, p ry treatment, biological treatment, chemical ment, activated carbon and other tertiary ment systems. In addition to these on-site ment techniques, combined treatment with municipal systems is discussed. Data from ex treatment facilities are used to illustrate the removal effectiveness of various techn (Kramer-FIRL)
W76-03097

UNIVERSITY OF CALIFORNIA PRO RECOVERS COPPER FROM LEACH LIQU
Engineering and Mining Journal, Vol 175, N 30, August, 1974.

Descriptors: *Waste water treatment, *Ind wastes, Copper, Mining, *Ion exchange, trodes, Separation techniques.
Identifiers: *Copper recovery.

A low cost process for copper recovery liquor resulting from the leaching of copp and scrap metal has been developed. A ce tested which consists of two compart separated by an AMF ion exchange mem These compartments are filled with granul bon which acts as electrodes, one charged tively and the other positively charged. Th so charged that copper from a fresh solu deposited on the carbon, while in the re solution compartment, copper is released i solution and the resulting concentrate is fe electrowinning plant. After five days, the p is reversed. The electrical driving force can curately controlled, and the method re about 99% of the copper in solution. (K FIRL)
W76-03098

FECTS OF GRAZING ON INFILTRATION
TES IN WASTE WATER SPRAY FIELDS,
icultural Research Service, Morgantown, W.
Plant Science Div.
A. Pearson, G. A. Jung, R. E. Fowler, and D.
Mitchell.
l Science Society of America Proceedings, Vol
No 5, p 954-957, September-October 1975. 1
2 tab, 26 ref.

criptors: *Compaction, *Food processing in-
try, *Irrigated land, *Infiltration rates, Waste
er(Pollution), Spraying, Grasses, Waste water
tment, Soils, Grazing, Ponding, Rainfall, Satu-
d soils.
ntifiers: *Trampling, *Food processing, Ir-
ted pastures, Spray fields, Grass fields, Sandy
n, Sassafras sandy loam.

ny food processors use grass-covered
yfields for treatment waste water. These fields
generally mowed one or more times each year.
eliminate mowing costs, such fields could be
ed and used as irrigated pastures. However,
e the primary purpose of such fields is waste
er treatment, adverse effects on infiltration
t be avoided. particulary in areas with shallow
s that can not be manipulated for overland
. A portion of a food-processor's wastewater
tment field was fenced and grazed for approxi-
ely 5 months during the summer and fall of 2
cessive years. The soil series was Sassafras
ly loam and the grass species were 'Kentucky
tall fescue and orchardgrass (Dactylis
nerata, L.). The infiltration rate at saturation
measured frequently throughout the period of
ing. It was found that trampling reduced the
tration rate from an initial value of 2-2.5 cm/hr
final value of 0.3 cm/hr. If these fields had
n grazed, it would have been necessary to use
wastewater application rates to avoid surface
off and ponding in low spots. (Roberts-ISWS)
5-03124

RTIARY TREATMENT OF WASTEWATER
NG OXIDATION PONDS,
tucky Water Resources Inst., Lexington.
. Lauderdale, J. R. Moeller, and R. D.
nilton.
ilable from the National Technical Informa-
Service, Springfield, Va 22161 as PB-248 713,
0 in paper copy, $2.25 in microfiche. Research
ort No 89, December 1975. 40 p, 18 fig, 35 ref.
RT A-051-KY(1). 14-01-0001-4017.

criptors: *Tertiary treatment, *Sewage
ons, Effluents, Sewage bacteria, *Waste
r treatent, *Oxidation lagoons, Sludge treat-
t, Activated sludge, Biochemical oxygen de-
d.
tifiers: Waste water effluents.

purpose was to determine the value of using
ons as a supplemental process for treating the
ent from an activated sludge wastewater
ment plant. Only tentative conclusions can be
ested since the project was not carried to
pletion. It appears that lagoons will have only
mal effect on the amounts of total nitrogen
phosphate in the plant effluent, although con-
ion of a portion of the ammonia to nitrate can
xpected. However, the concentration of am-
ia was never lower than that required by EPA
elines. Some reduction of soluble BOD ap-
s to occur, perhaps through conversion to new
material. Suspended solids concentrations can
xpected to increase during periods of algae
th. The numbers of both fecal and total
orm bacteria decreased substantially during
detention period provided by the lagoon
m. Although not confirmed, it was concluded
the most probable cause for the decrease was
ntensity and duration of sunlight. The lagoon
d very effectively as a buffer between the
ment plant and the receiving stream, provid-
considerable measure of protection to the
m even during those periods during which the plant was by-passing a portion of the inflow. (Huffsey-Kentucky)
W76-03138

STUDY OF CROSSLINKED POLYMERS FOR DESALINATION,
Chemico Process Plants Co., El Monte, Calif. Envirogenics Systems.
For primary bibliographic entry see Field 3A.
W76-03147

DEVELOPMENT OF CTA HIGH FLUX LOW OPERATING PRESSURE R.O. MODULES,
Dow Chemical Co., Walnut Creek, Calif. Western Div. Research Labs.
For primary bibliographic entry see Field 3A.
W76-03149

FINAL REPORT--DETERMINING FEASIBILITY OF ALTERNATIVE APPROACHES OF OBTAINING SOLID-DRY BRINE EFFLUENT FROM DESALINATION PLANTS AT INLAND LOCATIONS,
Westinghouse Electric Corp., Lester, Pa.
For primary bibliographic entry see Field 3A.
W76-03152

FUTURE APPLICATIONS OF DESALTING PROCESSES FOR REDUCTION OF INDUSTRIAL WATER POLLUTION,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 3A.
W76-03153

FINAL ANNUAL REPORT-VERTICAL TUBE EVAPORATOR MULTISTAGE FLASH TEST BED PLANT, FREEPORT, TEXAS, APRIL 1, 1972 TO MARCH 31, 1973.
Bechtel Corp., San Francisco, Calif.
For primary bibliographic entry see Field 3A.
W76-03157

ECONOMIC ASSESSMENT OF AN ACTIVITY ANALYSIS MODEL FOR WATER SUPPLY PLANNING,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering; and Utah Water Research Lab., Logan.
A. B. Bishop, B. C. Jensen, and R. Narayanan.
Water Resources Research, Vol 11, No 6, p 783-788, December 1975. 5 fig, 10 tab, 4 equ, 12 ref.

Descriptors: *Water supply, *Planning, *Water reuse, *Linear programming, Water resources development, Economics, Optimization, Water policy, Water quality, *Utah, Pricing, Water demand, Decision making, *Mathematical models, Systems analysis, *Treatment facilities, Waste water treatment, Water treatment.
Identifiers: Least cost solution, Capacity expansion, Salt Lake City(Utah).

A mathematical model for assessing the water supply alternatives with the reuse option is described, and its potential to yield results useful for economic analysis and policy making is explored. The results of the model for Salt Lake County, Utah, used as a case study area, are shown. The relative marginal values reflecting quality and accessibility of various sources can aid in planning future water resource development. The supply curves derived from the model are useful for pricing policies. The relative locational advantages of water and waste water treatment plants enter importantly into capacity expansion decisions. The least cost solution indicates the necessity of a facility to recycle waste water for municipal use under increased demand conditions.
W76-03163

WATER PURIFICATION MEMBRANES AND METHOD OF PREPARATION,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
J. R. Hollahan, and T. Wydeven.
Available from NTIS, Springfield, Va 22161 as N75-13506, $3.50 in paper copy, $2.25 in microfiche. U.S. Patent Application Serial No. 313,389, 15 p, 5 fig; NASA Case No. ARC-10643-2, October 31, 1974.

Descriptors: *Patents, *Films, *Membranes, *Reverse osmosis, Thin films, Monomolecular films, Organic compounds, Fabrication, Desalination processes, Water quality control, Waste water treatment, Water purification.
Identifiers: Polymerization process, Patent application.

Allyl amine and chemically related compounds are polymerized as thin films in the presence of a plasma discharge. The monomer compound can be polymerized by itself or in the presence of an additive gas to promote polymerization and act as a carrier. The polymerized films thus produced show outstanding advantages when used as reverse osmosis membranes. The films achieve a maximum density during formation in the apparatus which results in little or no compaction when the film is used in reverse osmosis. The films are formed without pinholes in contrast with many prior films where small imperfections allow both solute and water to pass, and the film has a high adhesion on a variety of substrates and is easily formed in any desired configuration, so that one is not limited to flat surfaces to support the membrane. And finally while other membranes ordinarily must be kept in constant contact with pure water, this film can be stored dry under ordinary room conditions. (Sinha-OEIS)
W76-03171

GUNITING RESTORES A SEWER,
Clapsaddle-Garber, Marshalltown, Iowa.
For primary bibliographic entry see Field 8F.
W76-03193

INTERCEPTOR SEWER COST ANALYSIS,
Metropolitan Sanitary District of Greater Chicago, Ill. Sewer Design Section.
For primary bibliographic entry see Field 6C.
W76-03194

SEWER SYSTEMS IN THE COMMUNITIES AROUND LAKE SEVAN (SKHEMA KANALIZATSII NASELENNYKH MEST, RASPOLOZHENNYKH VOKRUG OZERA SEVAN),
S. S. Kotolikyan, and S. S. Zurgaryan.
Vodosnabzhenie i Sanitarnaya Tekhnika, No 6, p 14-15, 1975.

Descriptors: *Sewers, *Economics, Lakes, *Waste water treatment, *Biological treatment, *Treatment facilities, Water pollution control, Water quality control, Waste disposal.
Identifiers: *Lake Sevan(Armenian SSR), *USSR.

Plans for sewer systems for the communities around Lake Sevan, an important recreational area in the Armenian SSR, are presented. The option of full biological purification in five waste water treatment plants followed by discharging the purified effluents into Lake Sevan, was compared with biological treatment of all effluents in a common treatment plant with subsequent discharge into a river beyond the Lake Sevan water capture area. While the first choice would be more economical than the second one, the latter was chosen because of the added safety it offered regarding water pollution prevention in Lake Sevan. (Takacs-FIRL)
W76-03195

EXCAVATOR AND PUMPS CONQUER WATER TABLE.
For primary bibliographic entry see Field 8C.
W76-03196

SANTA CLAUS SEWAGE SYSTEM NEARS COMPLETION.
Water and Sewage Works, Vol 122, No 10, p 79, October, 1975.

Descriptors: *Sewerage, *Waste water treatment, *Sewage treatment, *Construction, Installation, Sewers, Municipal wastes, Industrial wastes, Clay pipes, Joints(Connections), Indiana, *Treatment facilities.

A sewerage system construction project in Santa Claus, Indiana, which cost $2 million was funded by a half grant, half loan from the Economic Development Administration (EDA). Sewage is processed in the $700,000 treatment plant at a rate of 500,000 gpd, and capacity can be increased to 800,000 gpd. The first phase for sewer line installation was completed in 1971. In December 1974, the Farmers Home Administration (FmHA) approved a loan of $1,360,000 and a grant of $250,000 to begin work on the final phase of the sewer system. This will serve primarily the domestic community as well as some light industry. All 118,000 feet of vitrified clay pipe have '0' ring compression joints; 18,885 ft of four-in diameter pipe, 2970 ft of six-in, 95,161 ft of eight-in, and 1036 ft of ten-in diameter pipe were supplied. Because much of the land in the area is hard rock formation, about 60% of the trenching had to be preceded by blasting with an air drill. Line and grade were monitored with a laser beam for laying the pipe. In the village area, 1850 new home sites are being built; each home lot carries a monthly $4 sewer charge to repay the FmHA loan. (Kramer-FIRL)
W76-03197

OXYGENATION EQUIPMENT--AERATORS AND PURE OXYGEN SYSTEMS,
Johnson (Bernard), Inc., Houston, Tex. Environmental Projects.
B. R. Tyer, and C. H. Hayes.
In: Chemical Engineering, Deskbook Issue, p 75-77, October 6, 1975. 1 fig, 11 ref.

Descriptors: *Oxygenation, *Aeration, Equipment, Installation, Economics, Rivers, Waste water treatment, Water quality, Costs, Treatment facilities.
Identifiers: Direct oxygenation.

Various types of aeration equipment (mechanical aerators, diffuser aeratio systems, brush aerators, venturi aerators) have been manufactured in the past few years. Onsite performances of several installed aerators used to oxygenate water were evaluated. The process design for direct oxygenation (using the UNOX system) as compared to air oxygenation, requires information on waste water quality and quantity, the required effluent quality, and relationships between the direct oxygen unit and other plant operations. In Batavia, New York, a demonstration project was performed to obtain comparative economic data on air and direct oxygenation systems. Results indicated a savings with direct oxygenation; costs for one mgd plant were projected as $0.12-$0.135 per lb of dissolved oxygen for direct oxygenation and $0.135-$0.165 for air, while those for a 100 mgd plant were $0.085-$0.095 for direct oxygenation and $0.105 $0.125 for air. In reaeration of the Ruhr river in Germany, however, air as the source of O2 was found to be more efficient. In another case, on the Great Miami River, Ohio, results of an instream aeration experiment with air and oxygen were reported. Direct oxygenation had the advantages of: a theoretical solubility advantage of 5:1 over air, the least disturbance to the water, the potential for supersaturating sidestreams with O2, and a cost of $0.084/lb of dissolved oxygen for direct oxygenation, as compared to $0.096/lb for surface aeration and $0.115/lb for air diffusion. (Kramer-FIRL)
W76-03198

LATEX PAINT WASTES--MUNICIPAL CHARGES AND TREATMENT,
East Bay Municipal Utility District, Oakland, Calif.
R. T. Williams.
In: Proceedings of the 29th Industrial Waste Conference, May 7, 8, and 9, 1974, Purdue University, Lafayette, Indiana, p 383-393. 13 tab, 9 ref.

Descriptors: *Pollution charges(Taxes), *Legislation, *Industrial wastes, *Sewers, *Municipal wastes, Construction costs, Operating costs, Waste water treatment, Chemical oxygen demand, Suspended solids, Water pollution control.
Identifiers: Municipal-industrial wastes, Latex paint industry, Sewer charges.

In view of federal regulations, the East Bay Municipal Utility District, Oakland, California, investigated the contribution of the latex paint manufacturing industry to the waste waters discharged to its municipal sewer system. The new regulations require municipal treatment agencies receiving construction grants for water pollution control facilities to recover from all industries their portion of the grant amount. The municipal agency receiving the grant must also adopt an equitable system of cost recovery reflecting the cost of treating the volume and quality parameters of the waste water. They also must define and enforce source control regulations on the industrial users. The strength characteristics and treatability of latex wash water were evaluated. Two treatment processes used at municipal plants were compared for efficiency, cost allocation, and revenue requirements. The rates charged the paint industry by the municipal agency for each process may be assessed or determined either on a surcharge basis or on a quality and quantity formula. Using a surcharge, the concentrations greater than 200 mg/liter of suspended solids and 400 mg/liter COD are computed, whereas the rates for a quality and quantity formula are assessed on the unit rates for volume and strength of the discharge. Latex is treatable either at the industrial facility of later by the municipal agency. The choice of treatment must be decided on a case-by-case basis, considering municipal effluent requirements, design criteria, and the proportion of industrial waste in the municipal plant effluent. (Kramer-FIRL)
W76-03199

RECYCLE OF LIQUOR FROM HEAT TREATMENT OF SLUDGE,
CH 2M Hill Inc., Corvallis, Oreg.
J. D. Boyle, and D. D. Gruenwald.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2482-2489, October, 1975. 2 fig, 5 tab.

Descriptors: *Activated sludge, *Waste water treatment, *Treatment facilities, *Recycling, Heat treatment, Sewers, Costs, Biochemical oxygen demand, Suspended solids.

A newly expanded waste water treatment plant at Colorado Springs provides activated sludge treatment for wastes including high-strength recycle liquors from a sludge heat treatment system. The concept of the plant design and the operational experience for its first year of service are described. Process difficulties which have been eliminated were those associated with the illegal discharge to the city sewers of chlorinated hydrocarbon and organic phosphorus insecticides. A continuing operational problem is foam on the secondary clarifier, probably due to handling of scum skimmings in the heat treatment process. The total cost of expanding the treatment facility was $8,490,000, which included the heat treatment system, engineering, legal, and administrative work. 'Hidden costs', such as the aeration power increase caused by the heat treatment recycle liquor, were also analyzed. It was difficult to co pare the costs of this system on a unit cost b with the costs of other solids conditioning syste because of the effect of the recycle streams. total costs of the heat treatment system, allow for recycle effects, was found to be approxima $40 per dry ton of virgin solids. The heat treatm recycle liquor BOD contributed about 21% of influent BOD load and about 30% of suspended solids load. (Kramer-FIRL)
W76-03200

WHEN TO USE CONTINUOUS FILTRAT HARDWARE,
Envirotech Corp., Salt Lake City, Utah. EIM BSP Div.
R. C. Emmett, and C. E. Silverblatt.
Filtration and Separation, Vol 12, No 5, p 577-580-581, September/October, 1975. 1 tab, 5 ref.

Descriptors: *Filtration, *Equipment, *Fil *Economics, Flow *Waste water treatment.
Identifiers: Batch filtration, Continuous filtrat

An analysis was made of the many types of tinuous filtration hardware available to the po tial user. Choice of filter must be made on basis of the types of slurries to be handled, fac considered in a continuous flowsheet, and ce economic limitations. The major properties feed slurry to be identified and evaluated suspended solids concentration, particle size tribution, system composition, liquid visco liquid volatility, degree of liquid saturation, perature, special properties of solids or li required materials of construction, and feed Once these are determined, the true requiren of a filter station are found by defining minimum tolerable performances and the (desired) performances of filtrate clarity, d of washing and filter cake liquid content. facets of filtration operation to be considere clude cake moisture, end use of solids, c limitations, total process flowsheet, product and in-process inventory, chemical conditio and pre-treatment of slurry. Almost any size tinuous filter station requires a minimum in ment of $20,000. Thus, if capital is severely li and feed slurry rate is relatively low, a batch rather than continuous filtration equipment be chosen. If batch and/or continuous filtr equipment is feasible, the final decision shou governed by economics, including process bility in the economic evaluation. A summa provided in tabular form of some of the majo tors to be considered in selecting equipment. ments are provided relative to the applicabil continuous or batch pressure filtration equip (Kramer-FIRL)
W76-03201

A NOTE ON OPTIMAL TAXATION OF VIRONMENTAL SPILLOVERS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5G.
W76-03202

FACTORS AFFECTING ADOPTION OF TREATMENT OF MUNICIPAL W WATER,
North Carolina State Univ., Raleigh. De Economics and Business.
G. A. Carlson, and C. E. Young.
Water Resources Research. Vol 11, No 5, 620, October, 1975. 1 fig, 3 tab, 21 ref.

Descriptors: *Waste water treatment, *Mu wastes, *Model studies, Economics, Stat methods, Costs, Analytical techniques, management.
Identifiers: Land application, Cost analysis.

Land treatment of municipal waste wat proven successful in the southern part United States. A model of local waste tre

nd application is presented. A demand curve nd treatment was derived, using data col- from 125 cities, assuming a profit-maximiz- ramework. Outputs of a waste treatment y were considered to be volume of waste , degree of waste removal, and potentially table by-product. The dependent variable doption or non-adoption of land treatment coefficients were estimated by non-linear sion. It was determined that the price of by- cts (water), price of capital, required degree atment, and local construction cost con- to an increase in adoption of land treat- The volume of river flow, rainfall, and ef- volume have a negative effect on adoption, land prices are not significant. The cost anal- suggests that municipal sanitary officials l try to determine what degree of treatment and nutrient removal) will be required by fu- tate and federal regulations in order to better heir treatment alternatives. (Kramer-FIRL) 3203

GN VALUE IN, WASTE OUT,
e-Berger-Mansueto, Inc., Washington, D.C.
Dell'Isola.
merican City and Country, Vol 90, No 10, p October, 1975.

iptors: *Value engineering, *Waste water ent, *Construction costs, *Treatment facili- Analytical techniques, Equipment, Water control, Tertiary treatment.
iers: Cost effectiveness.

application of value engineering (VE) ques to waste water treatment plant con- on is described. The purpose of a VE or analysis method is to detect and eliminate essary costs. A multidisciplinary team of en- s, chemists, public officials and others work fining basic versus secondary functions. are then related to cost and 'worth'. Cost ling involves ranking the systems, tems, and special equipment of a project ighest to lowest in terms of total cost per The unit costs are then broken down into onal areas such as electrical, mechanical, ural. VE potential is determined and selec- project equipment is based on a cost/worth f this ratio is greater than two or three, poor and high costs are indicated. Part of this is includes determining total or life-cycle Value engineering was performed for a ille, Connecticut, proposed advanced waste treatment plant. After a week-long hop with consulting engineers and the Con- it Department of Environmental Protection entatives, the town identified a potential ost savings of over $1.4 million, from the l $7.5 million cost estimate. Savings were by consolidating several process operations one roof, by improving effluent quality with filter elements, and by using all-weather- equipment instead of structural protection -treatment facilities. (Kramer-FIRL) 3205

R MANAGEMENT IN ENGLAND: A RE- AL MODEL,
Carolina Univ. at Chapel Hill. Dept. of En- ental Sciences and Engineering.
mary bibliographic entry see Field 6B. 1207

GENCY REPAIR OF CRACKED HOLD- ANK,
State Univ., Normal. Coll. of Applied e and Technology.
mary bibliographic entry see Field 8F. 1209

MARSHES AND WETLANDS MAY PROVIDE SAFE COMMUNITY TERTIARY SEWAGE TREATMENT.
Compost Science, Vol 16, No 4, p 31, July-August, 1975.

Descriptors: *Waste water treatment, *Tertiary treatment, *Wetlands, *Marshes, Environmental effects, Biological treatment, Model studies, Waste water disposal, Water quality control.

The preliminary conclusion of a University of Michigan research project now in its third year is that marshes, bogs, swamps and other wetlands are able to provide high-quality tertiary sewage treatment. The project was designed to find out whether the natural processes in a 1,000 acre marsh near Houghton Lake in north central lower Michigan will be able to provide tertiary treatment of waste water without disturbing the ecological balance. The research has included a survey of pertinent scientific literature, the construction of a computer model of the marsh, and small, carefully controlled, on-site experiments. The model portrays the dynamic character of the marsh and accurately simulates the complex interactions among soil, water, wildlife, and climate. The model predicts that when millions of gallons of secondarily treated effluent are pumped into the marsh, the four-foot layer of peatland covering the area will absorb many of the dissolved nutrients in the water; only a small portion of the total will be utilized by vegetation. Wetlands bordering lakes and streams must not be used for treatment because of the risk that effluent would reach adjacent waters before being sufficiently purified. Each potential treatment site must be thoroughly studied to ensure that the wetland will be able to remain in an aesthetic and viable state, and the water quality will meet environmental standards. (Orr-FIRL)
W76-03210

STORM RUNOFF PURIFICATION IN COMBINED SEWER SYSTEMS IN TOWNS OF THE USA (OCHISTKA LIVNEVYKH VOD V SISTEME OBSHCHESPLAVNOY KANALIZATSII GORODOV SSHA),
N. A. Lukinykh.
Vodosnabzhenie i Sanitarnaya Tekhnika, No 7, 32-43, 1975. 3 fig, 3 tab.

Descriptors: *Storm runoff, *Combined sewers, *Treatment facilities, Biological treatment, Activated sludge, Aerobic conditions, Filtration, Lake Michigan, *Waste water treatment.
Identifiers: Microfiltration, Biosorption, Physico-chemical treatment.

Storm runoff purification in demonstration waste water treatment plants in Kenosha and Racine, USA are described. The Kenosha demonstration plant was dimensioned for an additional storm runoff of 78,500 cu m/day in rainy weather. The storm runoff is purified by a contact biosorption method using regenerated activated sludge of the principal waste water treatment plant in a quantity of 13,950 cu m at a contact time of 15 min. After the short-term contact and aeration, the storm runoff is sent to a radial settler from which the purified water is discharged into Lake Michigan; the activated sludge is sent to an aerobic stabilizing basin. The settling basin and the stabilizing basin are used for the stabilization of the excess activated sludge during dry weather, and for sludge storage during rainy weather. The storm runoff collected in the combined sewer system in Racine undergoes physico-chemical treatment by microfiltration and flotation tanks. Here, the storm runoff is treated with iron chloride (20-25 mg/liter) before microfiltration, and with cationic polyelectrolyte (1-4 mg/liter) after microfiltration. The water is disinfected with liquid chlorine at an expenditure of up to 20 mg/liter. One fourth of the water discharged from the microfilter is aerated to intensify the subsequent flotation process. The flotation residue is sent to the municipal biological waste water treatment plant. (Takacs-FIRL)
W76-03211

WIDE RANGE OF EQUIPMENT FOR SEWAGE DISPOSAL.
For primary bibliographic entry see Field 8C.
W76-03213

KILN DUST FROM CEMENT FACTORIES FOR VACUUM FILTER PROCESSING OF SEWAGE SLUDGE,
Pennsylvania State Univ., University Park. Dept. of Soil Chemistry.
D. E. Baker, S. Welch, W. Stout, and W. Doty.
Compost Science, Vol 16, No 4, p 28-30, July/August, 1975. 2 tab, 3 ref.

Descriptors: *Sludge treatment, *Waste disposal, Filtration, Sewage sludge, Lime, Flocculation, Analytical techniques, Economics, Energy, Sewage treatment, *Waste water treatment, Treatment facilities, *Filters.
Identifiers: *Vacuum filters, *Cement factory kiln dust.

A comparison was made between the use of kiln dust from cement factories and hydrated lime in the vacuum filter processing of sewage sludge within an operational sewage treatment plant. The conventional vacuum filter process of sludge uses hydrated lime and ferric chloride as flocculants. In this experiment, the coil filter was operated one day using the hydrated lime and the next day using kiln dust. Results were analyzed in terms of pH, dry matter, and chemical composition of raw sewage sludge; lime suspension produced from hydrated lime and kiln dust; filter cake produced by the vacuum filter process; and filtrate removed from the sludge in the process. It was found that kiln dust was equal to hydrated lime for processing the sludge and could be superior if used at a rate 1.3 times that normally used for lime. Because there is additional potassium and magnesium in the kiln dust, there is an advantage in its use where the filter cake and/or filtrate effluent are to be used as sources of nutrients for crop production. Economic advantages as well as energy conservation results from the use of kiln dust as a substitute for hydrated lime. (Kramer-FIRL)
W76-03214

ON THE OZONE TREATMENT AS PRE-TREATMENT OF ACTIVATED SLUDGE (KASSEI ODEN SHORI NO MAESHORI TO SHITENO OZON SHORI),
K. Aida, I. Somiya, and O. Kawara.
Preprint, Japan Society of Civil Engineers, Tokyo, p 667-668, October, 1975. 5 fig.

Descriptors: *Ozone, *Sewage treatment, *Chemical precipitation, Chemical oxygen demand, Biochemical oxygen demand, *Pre-treatment, Activated sludge, Biological treatment, *Waste water treatment.

Ozone treatment of sewage was investigated as a pre-treatment for the activated sludge method. Sewage was taken from the final precipitation pool of a sewage treatment plant in Kyoto, Japan, and its COD components were 184 mg/liter for the 3.8 to 0.45 micron size, and 57.1 mg/liter for the less than 0.45 micron size. A sample of 1.2 liter of liquid was treated in a batch type aeration tower with an ozonide oxygen flow rate of 2.0 liter/min. The ratio of COD values in the treated water and the initial water was then determined. Ozone concentration did not seem to have much affect upon the COD removal efficiency. COD removal proceeded quickly during the first five minutes of ozone treatment. The ratio obtained for total COD removal was 0.5 after the five minute ozone treatment. Eighty percent of the initial COD components sized greater than 0.45 microns could be removed in five minutes ozone treatment. During the ozone treatment, the BOD5 value did not increase, but the ratio between BOD5 and COD values increased. This suggests that the use of ozone as a pre-treatment method for activated sludge would increase the effectiveness of the

biological decomposition process in the waste water. (Katayama,FIRL)
W76-03215

PERMUTIT SA ENTERS SEWAGE TREATMENT FIELD.
South African Chemical Processing, Vol 10, No 4, p 27, June/July, 1975. 1 fig.

Descriptors: *Sewage treatment, *Treatment facilities, *Biological treatment, *Aeration, *Sludge treatment, Nitrification, Sedimentation, Waste water treatment, Settling basins, Africa.
Identifiers: *Contact Stabilization(CS), *Extended aeration, South Africa.

The Permutit company, South Africa, has expanded its primarily industrial waste water treatment activities to include sewage treatment. Initially, pre-engineered units will be used to treat up to 15,000 population equivalents. Either the Extended Aeration (EA) or the Contact Stabilization (CS) process will be used. The design criteria for sewage treatment facilities were sewage flow, composition (particularly BOD loading) and turn down ratio required. The EA process was found to be economical for small plants, while the CS sheme has advantages for larger size plants. The Contact Stabilization process was detailed. It consists of two aeration steps, separated by a settlement stage. In the first aeration stage raw sewage and stabilized activated sludge are mixed and aerated. After 0.25 to 1.50 hours, sludge and liquor are separated, and sludge is returned to a second aeration step for 1.5 to 5.0 hours. Because the total aeration time for EA is about 24 hours, the CS process has the time advantage. The CS process achieves a high degree of nitrification in spite of this short aeration time and has much better sludge settlement rates. The reason for this is that there are about four times the bacteria in the contact aeration zone than in other treatment processes. As a result, to up-rate a conventional plant to a CS plant, the only necessary change was found to be the extention of the settling tank area. (Kramer-FIRL)
W76-03216

SUPERNATANT AND FILTRATE TREATMENT,
Jones and Henry Engineers, Ltd., Toledo, Ohio.
F. F. Sampayo.
Pollution Engineering, Vol 7, No 9, p 36-38, September, 1975. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Effluents, Ammonia, Nitrification, Hydrogen ion concentration, Lime, Biochemical oxygen demand, Anaerobic digestion, Filtration, Filters, Suspended solids.
Identifiers: *Anaerobic digester supernatant, *Vacuum filter filtrate.

Production of high quality effluents, such as those planned for an improved waste water treatment plant in Pontiac, Michigan, will necessitate reconsideration of conventional processing methods for anaerobic digester supernatant and vacuum filter filtrate. These wastes shock load biological treatment processes by increasing BOD, suspended solids, and ammonia concentrations. A new process suggested for the Pontiac plant mixes the two waste streams, discharging them by gravity and heating them with available hot water from the incinerator exhaust gas scrubbing system. The pH is adjusted to 11 or 12 with lime and the high pH wastes are discharged to an ammonia stripping tank. This process is expected to reduce ammonia-nitrate concentrations in the recycle streams to 100 mg/liter or less, as well as removing substantial amounts of BOD and suspended solids. Ammonia discharge to the atmosphere will also be largely avoided. The process uses both chemicals sand power with efficiency. (Beale-FIRL)
W76-03218

HYDROGEN PEROXIDE SOLVES HYDROGEN SULFIDE PROBLEM,
Hampton Roads Sanitation District, Norfolk, Va.
S. R. Lindstrom.
Pollution Engineering, Vol 7, No 10, p 40-41, October, 1975. 1 fig, 1 tab.

Descriptors: *Odor, *Hydrogen sulfide, Waste water treatment, *Sewage treatment, Virginia, Anaerobic conditions, Treatment facilities, Environmental effects, Costs, Oxidation, *Waste water treatment.
Identifiers: *Hydrogen peroxide.

The Hampton Roads Sanitation District, Virginia, has found that hydrogen peroxide application was successful in eliminating noxious odors caused by hydrogen sulfide in a waste water treatment plant. Tests were conducted in two systems: the Chesapeake-Elizabeth System in Virginia Beach and the James River System in Newport News. Both systems were large, and sewage is pumped long distances through pressure lines for treatment. Anaerobic conditions result from a long sewage retention time, and high (7 to 8 ppm) levels of hydrogen sulfide are formed. Additionally, the buildup of H2S in working areas is a danger, and complaints of odors have been made by residents and people travelling on adjacent highways. Tests with hydrogen peroxide were initiated in April 1973 and a year later, as a result of successful odor removal, the two hydrogen peroxide injection systems were installed. Injection points were far enough upstream that hydrogen peroxide had at least ten minutes to react with the H2S before the sewage came out into the air at the head of the plant. At first a ratio of 2.5:1 was thought necessary (H2O2:H2S) to assure oxidation of all the hydrogen sulfide. At the James River system this was followed, with an injection ratio of 17.5 ppm. The Chesapeake-Elizabeth system experimented and found that 15.3 ppm would also effectively destroy all the hydrogen sulfide, with a lower cost. Installation involved a simple passivated aluminum storage tank, two variable speed pumps, and necessary piping; there were no real maintenance costs. Thus, the only expense was the cost of hydrogen peroxide. The daily cost at both plants was $1,325, higher than costs of chlorine, but without chlorine handling or residual hazards. (Kramer-FIRL)
W76-03219

ON THE NITROGEN BEHAVIOR IN THE PROCESS OF OZONE TREATMENT (OZON SHORI NI OKERU CHISSO NO KYODO NI TSUITE),
K. Aida, I. Somiya, and H. Yamada.
Preprint, Japan Society of Civil Engineers, Tokyo, p 524-525, October, 1975. 25 fig.

Descriptors: *Nitrogen, *Ozone, *Sewage treatment, *Waste water treatment, Proteins, Nitrates, Amino acids, Hydrogen ion concentration, Ammonium compounds, Recycling.

The transformation of nitrogen compounds of amino acids and protein in sewage upon ozone treatment was studied using glycine, glutamic acid, and albumin in cow serum. The concentrations of nitrate ion, ammonium ion, amino acids, and protein in solution were compared to the ozone treatment time, and the effect of the initial solution pH on these nitrogen transformations was also studied. In the case of glycine, the initial concentration was adjusted so that the initial nitrogen in the solution was 9.3 mg/liter; the solution was then treated with ozone. After 40 minutes of ozone treatment, the nitrogen composition in the treated solution was 50% nitrate, 45% ammonium, and 5% amino acid. These changes were not greatly affected by the initial solution pH, and the nitrate and ammonium productions were increased with an increase in ozone treatment time. The nitrogen transformation for glutamic acid was similar to the result obtained with glycine, and was unaffected by the solution pH. The albumin could be ozonized from a solution with a pH between 6.39 and 9.8 however, the amount of unrecovered nitrogen i creased with the increased ozone treatment tim The recovery of the initial nitrogen (6.5 mg/lite after 40 minutes of ozone treatment was 1 mg/liter and 50% of this was ammonium with th rest being protein. Nitrate was produced durin the ozone treatment of albumin, but could not b detected after 40 minutes of treatmen (Katayama-FIRL)
W76-03221

OZONE CONTACT SYSTEM FITS INTO TIGH GRIT CHAMBER,
New York City Dept. of Public Works. Bureau Water Pollution Control.
M. Baratt, and A. Somerville.
Pollution Engineering, Vol 7, No 10, p 38, O tober, 1975.

Descriptors: *Ozone, *Odor, *Sewage treatme *Treatment facilities, New York, Constructi materials, Hydrogen sulfide, Methane, Air pol tion, *Waste water treatment.

The Manhattan Grit Chamber in New York C treats all sewage and storm drainage for 3253 ac of upper east side Manhattan. Pollution cont facilities are being continually expanded modernized. Methane and hydrogen-sulfide ba odors had caused a serious problem and an ozo contact chamber was designed to oxidize the and relieve the condition. While ozone cont chambers are ordinarily built with stainless s supports and concrete walls, there was not prop ty available to construct this type of a facility c tiguous to the chamber. It was therefore decide locate the contact chamber within the building combination of fiberglass reinforced plastic st turals supporting rigid baffles of polyvi chloride, reinforced with embedded steel w was constructed. These baffles, unaffected by ozonated air, contributed to a weight savings. ozone contact chamber measured 21 by 96 ft. ozone generator was operated 24 hr/day, 7 d per week, producing ozone in a one percent c centration at a rate of 17.6 lb/day. Tube axial moved the odor-filled air through stainless s ductwork up to the ozone chamber maze whe mixed with ozone. Minute organic particles w rendered inert and methane and hydrogen sulf based odors were eliminated. (Kramer-FIRL)
W76-03223

COLESHILL AWT WORKS--'A VERY DE-L PLANT'.
Surveyor, Vol 146, No 4348, p 9, October 10,

Descriptors: *Tertiary treatment, *Pilot pl *Waste water treatment, *Sewage treatment, watering, *Treatment facilities, Laboratory t Biological treatment, Flocculation, Lime, Se basins.
Identifiers: Physico-chemical treatment, vanced waste water treatment plant, Che treatment, Great Britain.

The Advanced Waste Water Treatment plan experimental works, has been built under N auspices at Coleshill, near Birmingham, Britain. The Coleshill works was built as a plant and the goal of the project was to allow techniques to be assessed under near full conditions. The installation provides for two ment streams, each with an average daily flo 454 cu m. One stream is completely dom while the other sewer contains some indu waste water. The fixed Coleshill installatio include inlet works, a services gantry, a re preparation plant, sludge dewatering equip monitoring, instrumentation, and a labor workshop, substation, and office buildings tially physical-chemical treatment will b amined; later other processes, particularly binations of physical-chemical and biol treatment will be evaluated. The two p

ams may be operated independently so that ormance of the two processes may be com- d simultaneously. A mobile modular concept be used for the facility, so that operating con- ns for individual units can be altered without ging the whole process, and units needing ir or modification can be removed and sub- ted. Work so far has concentrated on the use chemically-aided settlement using available ng, flocculation, and settling tanks. Further involved the addition of lime together with c sulfate to one stream, with the other as a pri- sedimentation control. The addition of nicals has been found to significantly reduce hosphate concentration. (Kramer-FIRL) -03224

ASE PROBLEMS IN MUNICIPAL WASTE- TER TREATMENT SYSTEMS,
A Engineering Corp., Baltimore, Md. Environ- tal Div.
. Banerji, C. M. Robson, and B. S. Hyatt, Jr.
Proceedings of the 29th Industrial Waste Con- nce, May 7-9, 1974. Purdue University, yette, Indiana, p 768-781. 1 fig, 7 tab, 27 ref.

criptors: *Oil wastes, *Municipal wastes, ste water treatment, Analytical techniques, strial wastes, Waste disposal, Sewers, nomics, *Pollutant identification.
tifiers: *Grease, Municipal-industrial wastes.

lems of the discharge of industrial wastes high grease, fat, or oil contents into municipal r systems were presented. Methods of analy- or grease, fats, and oils were reviewed, and able technology for removing this material waste water and subsequent disposal ods were discussed. Two case histories were ucted. One compared pre-treatment of indus- waste water containing grease at the source is providing grease removal facilities at a mu- al waste water treatment plant. The second y described the economic analysis of two al- te pre-treatment systems for removal of e from a poultry processing waste water. It concluded that the present level of 100 ter hexane or ether soluble grease and oil as a non limitation for municipal sewer ordinances ld be re-evaluated. Ay future grease or oil val data or criteria should state the analytical edure used. For example, if a solvent extrac- method is used, the solvent should be ified. Additionally, when industrial wastes reated at the source for grease or oil removal, municipal sewer and waste water treatment operations will be reduced. (Kramer-FIRL) -03225

MARY-WASTE-TREATMENT METHODS,
rontech Corp., Salt Lake City, Utah.
Lash, and E. G. Kominek.
Chemical Engineering, Deskbook Issue, p 49- October 6, 1975. 14 fig, 4 tab, 12 ref.

riptors: *Sewage treatment, *Waste water ment, *Industrial wastes, *Municipal wastes, ment facilities, Chemical precipitation, Oil es, Separation techniques, Filtration, Coagu- n, Costs, Centrifugation, Suspended solids.

ods of primary treatment of waste water are ndent upon whether the effluent will be sub- d to further treatment or whether it will be arged to a municipal sewer system, a river, or e where its effluent quality must meet federal, and/or local standards. Fourteen types of ary treatment are detailed. These are: screen- centrifugal separation, neutralization, aera- chemical oxidation, chemical reduction, pitation, coagulation, gravity separation, in- d-air flotation, dissolved-air flotation, media tion, diatomite filtration, and ultrafiltration. ral of these treatment methods will reduce a pollution load to within required limits, used alone or in some combination. The decision to discharge wastes to a municipal sewer system for partial or complete treatment must be based on a comparison of capital and operating costs and sewer charges. The decision to install a treatment plant and its possible layout were discussed. Choice of waste treatment is dependent upon waste composition, including: acids and alkalis; suspended solids; fats, oils and greases; and dissolved solids, both mineral and organic. A selection among each of the fourteen primary waste treatment methods for removal of dissolved solids, suspended solids, and oil matter from waste waters must be based on physical and chemical properties of the stream. Layout of a waste treatment facility must be determined by the worst possible combination of flow and pollutant-load variation. (Kramer-FIRL)
W76-03226

EQUIPMENT FOR DEWATERING WASTE STREAMS,
Dorr-Oliver, Inc., Stamford, Conn. Environmental Technology.
R. R. Evans, and R. S. Millward.
In: Chemical Engineering, Deskbook Issue, p 83-87, October 6, 1975. 4 fig, 1 tab, 4 ref.

Descriptors: *Dewatering, *Waste water treatment, *Waste treatment, *Sludge treatment, *Oil wastes, *Chemical industry, Activated sludge, Equipment, Centrifugation, Separation techniques, Waste disposal.
Identifiers: Sludge volume index(SVI), Sludge handling.

Various types of dewatering equipment are available to achieve desired concentrations of wastes for minimum costs of subsequent sludge handling. In selecting a particular dewatering technique, the specific process waste stream must be evaluated. The three general categories of waste sludges are primary solids, chemical precipitates, and biological solids. In petroleum refining, primary solids include oil-coated corrosion products, carbon, catalyst fines, sand, and silt. In the pulp and paper industry, sludge solids contain fibers and insoluble constituents, while in organic chemicals industry, primary solids may be unwanted byproducts, and used processing aids. The most common chemical precipitates generated during liquid waste treatment include metals. Biological sludges vary widely in characteristics, and thus require many types of dewatering equipment. The thickening characteristic of sludge, or sludge-volume index (SVI), from the activated sludge process may vary from 50 to 350. Evaluation of the alternatives for dewatering involves matching of process requirements and separation techniques. Various gravity thickeners, centrifuges, vacuum filters, and filter presses were compared. It was emphasized that engineers must develop their objectives (such as product parameters of solids in the liquid phase, and liquids in the solid phase) and define feed conditions (including solids concentration, density, and particle size), and base equipment selection of these data. (Kramer-FIRL)
W76-03227

NITRIFICATION OF A HIGH AMMONIA CONTENT SLUDGE SUPERNATANT BY USE OF ROTATING DISCS,
Metropolitan Sanitary District of Greater Chicago, Ill. Dept. of Research and Development.
C. Lue-Hing, A. W. Obayashi, D. R. Zenz, B. Washington, and B. M. Sawyer.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Part 1, Lafayette, Indiana, Purdue University, p 245-254. 5 fig, 7 tab, 9 ref.

Descriptors: *Nitrification, *Ammonia, *Sludge, Biochemical oxygen demand, Chemical oxygen demand, *Waste water treatment, Nitrates, Nitrites, Nitrogen, Alkalinity, Microorganisms, Suspended solids, Chemical analysis, Effluents, Lagoons, Anaerobic digestion, Strip mines, Monitoring.
Identifiers: *Sludge lagoon supernatant, *Rotating disc system.

When anaerobically digested sludge is stored in lagoons, awaiting use as fertilizer for strip-mined lands, a substantial layer of sludge lagoon supernatant (SLS) is formed. SLS has a relatively high concentration of NH3-N, making it undesirable for use on the land. The feasibility of nitrifying SLS using a rotating disc system (RDS) is discussed. The rotating discs provide an area for the attachment and growth of microorganisms and a means of aeration of the sludge. The objectives of the study were to determine whether a sufficient population of nitrifiers could be established on the discs to oxidize the ammonia waste water in a reasonable amount of time and to evaluate the ability of the RDS to act as an aeration-reaeration system. The total surface area of the discs in the RDS was 250 sq ft, and they rotated at a speed of 3 rpm. The temperature was kept at a constant 22 C. Since nitrification causes a destruction of alkalinity, pH had to be controlled and monitored. The RDS was monitored and sampled once a day, seven days a week. Various chemical analyses were run on influent and effluent samples, in order to monitor pH, biochemical oxygen demand, chemical oxygen demand, suspended and total solids, and the concentrations of ammonia, nitrates, nitrites, and nitrogen. Results showed that NH3-N, at an overall loading of 25 lbs/1,000 cu ft/day was reduced by 99% by the RDS. (Pinto-FIRL)
W76-03228

THE EFFECT OF CIRCULATION BAFFLES ON THE OXYGENATING EFFECT OF AERATORS OPERATING IN HORIZONTAL POSITION (WPLYW PRZEGRODY CYRKULACYJNEJ NA EFEKTY NATLENIANIA URZADZEN PRACUJACYCH NA WALE W POZYCJI POSIOMEJ),
For primary bibliographic entry see Field 5F.
W76-03229

WASTE WATER TREATING OPERATION USING MICROBIAL MEMBRANE (I). ANALYSIS OF RESISTANCE TO MOVEMENT WITHIN LIQUID PHASE,
For primary bibliographic entry see Field 5A.
W76-03230

METHODOLOGY FOR APPLICATION OF ADENOSINE TRIPHOSPHATE DETERMINATION IN WASTEWATER TREATMENT,
Biospherics Inc., Rockville, Md.
G. V. Levin, J. R. Schrot, and W. C. Hess.
Environmental Science and Technology, Vol 9, No 10, p 961-965, October, 1975. 6 fig, 2 tab, 14 ref.

Descriptors: *Waste water treatment, *Sewage, *Activated sludge, Analytical techniques, Operation, Monitoring, Treatment facilities, Pollutant identification.
Identifiers: Adenosine triphosphate(ATP).

Because the operation of an activated sludge waste water treatment plant is based on the metabolic activity of the viable organisms present in the mixed liquor, it is necessary to have a rapid and accurate method for determining the viable biomass. A method based on the bioluminescent assay of microbial adenosine triphosphate (ATP) is presented for this purpose. Boiling TRIS buffer was selected for the extraction of ATP from sludge and mixed liquor because of its simplicity of procedure and reproducibility of results. The determination of ATP, dissolved oxygen uptake rate, tyrosine, total microscopic cell count, and turbidity in pure cultures indicated the sensitivity of the method and its applicability to activated sludge process monitoring and control. ATP measurements were then performed in a 20 mgd activated sludge sewage treatment plant. ATP analysis was used to control the mixed liquor biomass

through the regulation of return sludge. A test period of one month demonstrated that good plant performance was achieved by using the ATP monitoring technique, and that there is a close relationship between ATP content and the metabolic activity of the sludge. The process should improve the quality and stability of the effluent as well as reduce operating costs and effectively increase plant capacity by minimizing the return sludge pumping. (Orr-FIRL)
W76-03232

AUTOMATED METHODS FOR ASSESSING WATER QUALITY COME OF AGE,
Technicon Industrial Systems, Tarrytown, N.Y.
For primary bibliographic entry see Field 5A.
W76-03233

OXYGEN TRANSFER AT HIGH SOLIDS CONCENTRATIONS,
Minnesota Marine Advisory Service, Duluth.
D. R. Baker, R. C. Loehr, and A. C. Anthonisen.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol 101, No EE5, p 759-774, October, 1975. 13 fig, 1 tab, 8 ref.

Descriptors: *Aeration, *Design criteria, *Oxygen, *Waste water treatment, Biological treatment, Oxygen demand, Nitrification, Municipal wastes, Industrial wastes, Temperature, Viscosity.
Identifiers: *Oxygen transfer, Mixed liquors, Oxygen uptake rates.

The design of aeration systems for agricultural, industrial, and municipal wastes requires the knowledge of the capability of an aeration device to transfer oxygen to the waste water. Because factors affecting the capability are related to the characteristics of the waste water being aerated, this investigation was conducted to determine how the characteristics of the mixed liquor affected the oxygen transfer capacity of the aerator. Variations in oxygen demand that occurred under operating conditions were also evaluated. This particular study involved oxygen transfer and uptake relationships of waste waters at the solids concentrations found in animal waste treatment facilities. After 13 months of study, the changes in solids concentration and temperature and their effects on oxygen uptake and transfer rate in the mixed liquor were evaluated. Relationships were also found between viscosity, total solids, and alpha. It was found that oxygen uptake rates were not influenced by temperature or total solids concentration variations. Alpha was seen to decrease as the solids concentration increased above 2% and as viscosity increased. Alpha was not affected by temperature variations. The viscosity of the mixed liquor increased with an increase in solids concentration, and the effect of solids on oxygen transfer may be related to viscosity. The appropriate parameters were found for design of an aeration system treating these particular wastes. For cases when solids concentration is greater, a larger dissolved oxygen residual is needed, or a higher nitrification degree is required, the rotor should be designed for a greater oxygen transfer capacity. (Kramer-FIRL)
W76-03236

CHEMICAL TREATMENT FOR PHOSPHATE CONTROL,
California Univ., Berkeley. Div. of Hydraulic and Sanitary Engineering.
J. N. DeBoice, and J. F. Thomas.
Journal Water Pollution Control Federation, Vol 47, No 9, p 2246-2255, September, 1975. 4 fig, 4 tab, 11 ref.

Descriptors: *Phosphate, *Chemical precipitation, *Computer programs, *Model studies, Calcium, Carbon dioxide, *Waste water treeatment.
Identifiers: Phosphate precipitation, Calcium phosphate, *Chemical treatment.

A computer program has been developed that is useful for determining the general effects of waste water treatment process modifications and variations on calcium phosphate precipitation and for comparing the efficiencies of alternative treatment processes. The program is based on an equilibrium model which considers precipitation of Ca3(PO4)2 and CaCO3 with pIAP values of 25.46 and 7.13, respectively. Pilot plant results were in agreement with computer results. The chemical process found to have the greatest effect on phosphate precipitation was the exchange of carbon dioxide with a gas phase. More than 90% of the phosphate in a typical waste water with an initial pH of 7.1, total calcium of 60 mg/liter as Ca, and total orthophosphate of 9.3 mg/liter as P could be precipitated by equilibrating the solution with an atmosphere containing 0.033% CO2. Additionally, higher final phosphate concentrations are to be found in processes with high levels of dissolved CO2 than those with low levels of dissolved CO2. It was recommended that the techniques and methodologies developed to solve this problem should be used for other areas. Similar possible studies include the precipitation of aluminum and iron phosphates for phosphate removal; precipitation of calcium carbonate in lime-softening processes; and precipitation of carbonates, sulfates, and silicates in recirculating cooling systems, heat exchangers, or ammonia-stripping towers. (Kramer-FIRL)
W76-03242

MUNICIPAL WASTEWATER PLANT PROBLEMS WITH CYANIDE EFFLUENT REGULATIONS,
Metropolitan Sanitary District of Greater Chicago, Ill. Industrial Waste Div.
D. T. Lordi, C. Lue-Hing, and E. Knight.
In: Proceedings of the 29th Industrial Waste Conference, May 7, 8, and 9, 1974. Lafayette, Indiana, Purdue University, p 338-347. 5 fig, 5 tab, 6 ref.

Descriptors: *Toxicity, *Effluents, *Waste discharge, *Industrial wastes, *Municipal wastes, *Pollutant identification, *Sewage treatment, *Waste water treatment, Analytical techniques, Legislation, State jurisdiction.
Identifiers: *Cyanides.

The Illinois Pollution Control Board (IPCB) cyanide standard of 0.025 mg/liter for discharge to waterways and to municipal sewer systems was evaluated. Studies were performed on the determination of cyanide levels present in treatment plant effluents and the raw sewages to each of the three major Chicago-area treatment plants. Other sources of cyanide not attributable to industrial cyanide wastes were also measured. The possible identification of effluent cyanide as simple and/or complex was then made. It was found that effluents from some of the smaller treatment plants having no known significant industrial waste load showed daily values exceeding the 0.025 mg/liter limit (including analytical variations). Between 92 and 100% of the time, these plant effluent cyanide levels were below 0.050 mg/liter, and averaged between 0.010 mg/liter and 0.024 mg/liter. A program has been initiated to determine whether the form of cyanide occurring in raw sewages and final effluents is simple or complex. It appears so far that 67% of the raw sewage entering the Calumet (a large industrialized plant) facility is of the complex form, and that cyanide generally predominates in the complex form. Because there are non-industrial sources of cyanide in domestic waste waters that would not be controllable through industrial waste enforcement, it was concluded that effluents from municipal treatment plants would have low levels of total cyanide in excess of the present IPCB standard at least some of the time. Further investigation is recommended to determine the proportions of simple and complex cyanide compounds found in effluents and their relative toxicities, in order to evaluate the numerical limit for cyanide level. (Kramer-FIRL)
W76-03247

FATE OF WASTEWATER PHOSPHORUS IN SOIL,
Robert S. Kerr Environmental Research Lab. Ada, Okla. Water Quality Control Branch.
For primary bibliographic entry see Field 5B.
W76-03250

EFFECT OF HALOGENS AND OZONE ON SCHISTOSOMA OVA,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W76-03252

RESEARCH NEEDS FOR WATER RESOURCE CONTROL IN CALIFORNIA.
California State Water Resources Control Board Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5G.
W76-03265

COMPUTER PRINT-OUT SHEETS. USER MANUAL, INTEGRATED AMMONIA MODEL.
Houston Univ., Tex.
Available from the National Technical Information Service, Springfield, Va 22161 as PB237-22 Price $5.00 in paper copy, $2.25 in microfiche. National Science Foundation, Report No NSF/RA/ 74-007B, 1974. 100 p. NSF-GI-34459.

Descriptors: *Ammonia, *Chemical industr *Computer programs, *Model studies, Chemic wastes, Water utilization, Consumptive use, Co analysis, Energy, Water treatment, Natural ga Texas, Cooling towers, Electric power, Stea Fuels, Waste water(Pollution), Cooling wat Heat transfer, Dissolved solids, Demineralizatio Waste disposal, Effluents, Nuetralization.
Identifiers: Houston(Tex).

Sample computer outputs from a model relati water and energy use and water treatment to co for an ammonia plant are shown. The pl produces ammonia from natural gas. The tegrated ammonia model (Houston parametri contains information on energy, pressure red tion, fuels, electricity, natural gas, naphth methane, ammonia, salt, steam, water, waste h and water, demineralizer outputs, river wat blowdown solids, dissolved solids, suspend solids, cooling (once through, recycled, and a heat transfer vectors, flash evaporation, efflu disposal clarification, landfill disposal, and co (Buchanan-Davidson--Wisconsin).
W76-03282

CHANGING WATER USE IN SELECT MANUFACTURING INDUSTRIES,
National Bureau of Economic Research, In Washington, D.C.
For primary bibliographic entry see Field 3E.
W76-03284

INTERDEPENDENCE OF AIR, WATER, A SOIL POLLUTION CONTROL STRATEGIES A POWER PLANT AND A KRAFT MILL,
Battelle Columbus Labs., Ohio.
P. Choi, N. Dee, and H. Reiquam.
Water, Air, and Soil Pollution, Vol 4, No 3- 381-394, 1975. 6 fig, 4 tab, 10 ref. CEQ 315.

Descriptors: *Pollution abatement, Analy *Control systems, Air pollution, Water pollut Soil contamination, Powerplants, Coals, I wastes, Industrial wastes, Pollutants, Technol Capital costs, Operating costs, Electric pow Environmental effects, Waste disposal.
Identifiers: *Emissions, Coal-fired powerplant

The cross-media (air, water, and soil) imp from various control strategies in coal-fired po plants and kraft mills must be evaluated prio their application. Such information includes

ated qualitative and quantitative data on pri-
y and secondary emissions to all media, energy
uirements, raw material usages, and capital and
rating costs. This information can be obtained
n an engineering analysis of control strategies
emission data. The procedure and results of
h analyses are presented on seven control
tegies for a 1000 MW coal-fired power plant
ten control strategies for a 1000 air-dried ton
ulp per day kraft paper mill. Uncontrolled pol-
nt emissions, controlled emission levels, and
lts for each control technology are described.
luation of control strategies for only one medi-
may mislead the overall effectiveness of the
tegies, consequently evaluations should be
d on controls for air, water, and soil. If en-
nmental impacts for unit pollutant emission
depending on the type of pollutant, efforts
be necessary to measure the magnitude of
ages created by various pollutants and to as-
the relative importance or significance of
ages to the environment. Factors such as
ital and operating costs, energy requirements,
resource needs are incorporated in the evalua-
s. (Buchanan-Davidson--Wisconsin).
5-03297

LIOGRAPHY OF WATER POLLUTION
NTROL BENEFITS AND COSTS,
elopment Planning and Research Associates,
, Manhattan, Kans.
primary bibliographic entry see Field 5G.
5-03298

E EFFICIENCY OF HEAVY METAL
MOVAL BY A CONVENTIONAL AC-
ATED SLUDGE TREATMENT PLANT,
ada Centre for Inland Waters, Burlington
tario).
. Oliver, and E. G. Cosgrove.
er Research, Vol 8, p 869-874, 1974. 3 fig, 4
10 ref.

criptors: *Heavy metals, *Sewage treatment,
wage sludge, *Activated sludge, Efficiencies,
atment facilities, *Waste water treatment.

total and dissolved concentration of cadmium,
mium, cobalt, copper, iron, lead, manganese,
cury, nickel, and zinc at various points in a
ventional activated sludge treatment plant
e measured. Samples of raw sewage, primary
ent, aeration tank contents and final effluent
e collected hourly for a 3-day period and a 4-
k period, then analysed individually and as 8-h
posites on a proportion to flow basis, respec-
y. The analysis of raw sewage samples col-
d hourly over the 3-day period showed that
l input to the plant was not a continuous
ess, but consisted of slugs of metal lasting for
screte time. The efficiency of heavy metal
oval by this model treatment plant was deter-
d by monitoring the influent and effluent
l levels over the 4-week period. It was shown
the activated sludge treatment process does
ove heavy metals to a certain degree. All the
ls removed are concentrated in the sludge.
rovements and possible need for tertiary treat-
ts are discussed. (Hoyle-Vanderbilt)
-03306

YGEN TRANSFER IN FERMENTATION,
a State Univ., Ames. Dept. of Chemical En-
ering.
primary bibliographic entry see Field 5A.
-03321

MPUTER CONTROLS PUT 'WASTE'
TER TO GOOD USE,
tral Contra Costa Sanitary District, Walnut
k, Calif.
. Horstkotte, Jr., and D. G. Niles.
American City and County, Vol 90, No 10, p
5, October, 1975.

Descriptors: *Computers, *Control systems, *Waste water treatment, *Sewage treatment, Treatment facilities, *California, Water reuse, Economics.

Computer control is used in reclaiming up to 30 mgd of effluent from the Central Contra Costa Sanitary District, California, sewage treatment facility. The reclaimed effluent will be sold to the Contra Costa Water District, who will then sell it to refineries, chemical industries, and power plants for use as cooling and process water. The effluent must be a high quality, essentially free of contamination and nutrients. The waste water reclamation plant will achieve this quality with a process of high-lime treatment, biological denitrification, and mixed media filtration. The water quality is maintained by a direct digital control (DDC) system, one of the first of its kind in the United States. All process functions are controlled and monitored directly. One part of the dual computer acquires data and controls process functions while the other handles off-line functions and provides standby capability. Only about 88% of the manpower needed for a comparable conventionally controlled facility is required to operate the Contra Costa plant. The 30 mgd plan will eventually be expanded to a 120 mgd capacity. Laboratory and pilot studies are underway, and energy recovery by burning some of the municipal solid waste of the area is a major priority for future construction. (Kramer-FIRL)
W76-03323

WATER AUTHORITIES' RESEARCH NEEDS,
P. Stott.
Water, No 5, p 16-26, October, 1975.

Descriptors: *Research and development, *Water treatment, *Sewage treatment, *Waste water treatment, Water resources development, Water quality, Economics, Recycling.
Identifiers: Cost-effectiveness, Water authorities(Great Britain).

Research needs were outlined by the Water Research Center (WRC), Great Britain, for the areas of water treatment and quality, sewage treatment, coasts and estuaries, water distribution and sewerage, sludge treatment and disposal, resources management, and fisheries and recreation. Problems and priorities were defined; the recommendation that the WRC and Water Authorities (WAs) work cooperatively was made. The dominant problems for water and waste water treatment are economics and water quality. Quality problems in water treatment are often linked with distribution. For England and Wales, assessing water treatment costs was difficult because marginal treatment costs will be higher than present treatment costs. It was found, however, that water treatment costs are less than sewage treatment costs and of a lower order of magnitude than the costs of water mains. Cost-effectiveness is central to the problems in sewage treatment. The capital investment in new and extended sewage works is now over L1000 m per year. Savings could be achieved in the operation and maintenance of small sewage works if more data were obtained on their tolerance to loading variations. In the field of sewers and water mains, operational problems directly influence costs. Current spending on pipes by WAs represents more than half their capital investment and the improvement of technology and materials has a high priority. Sewage sludge treatment and disposal, which now requires an annual capital expenditure of over L35 m, may be improved by encouraging research in agricultural applications or in the recycling and reuse of sludge by-product. (Kramer-FIRL)
W76-03325

RE-USE OF SEWAGE EFFLUENT AND SLUDGE,
A. J. Francis, J. R. Coldrick, and M. A. Stonebridge.
Journal of the Institution of Water Engineers and Scientists, Vol 29, No 4, p 196-200, June, 1975. 13 ref.

Descriptors: *Recycling, *Water reuse, *Sewage effluents, Sewage sludge, *Sludge disposal, Waste disposal, Activated sludge, Water resource development, Organic compounds.
Identifiers: Municipal-industrial wastes.

The prospects for reuse of sewage effluent and sludge in Great Britain were examined. The annual expenditure on sludge disposal is L10 to L20 million; with proper reclamation of water, gas, and specific chemicals, this sludge might be made to yield a profit. Several examples of economic reuse were provided. In one case, 3 mgd of water recovered from sewage effluent (after secondary treatment) has been sold to local industry by the Avonmouth sewage treatment works for yearly return of L61,000. Sewage sludge has been used as a soil conditioner or fertilizer but must be closely monitored for heavy metal content. Several facilities where sludge is dried and sold to farmers and market gardeners are described. Another example of reuse is the utilization of the methane gas produced by sludge digestion. At many sewage treatment works this gas is collected to power dual-fuel generators and turbines. Protein from activated sludge has been separated and fed to animals as a nutritional supplement. Specific organic chemicals (proteins, amino acids, nucleic acids, enzymes and vitamins) might also be extracted. Additionally, grease (from municipal-industrial waste streams) combined with sewage effluents has been recovered at the Eshold Works, Bradford and has been resold to industry as a fuel oil. Other miscellaneous products of sewage and sludge include paper, oil, plastics, and adsorbents. To achieve an optimal reclamation of these resources, support in marketing and publicity by the Regional Water Authorities and the national government are needed. (Kramer-FIRL)
W76-03326

REAL OR RASH REGIONALIZATION,
For primary bibliographic entry see Field 5F.
W76-03327

THE UTILISATION OF SEWAGE SLUDGE,
R. Wood.
Effluent and Water Treatment Journal, Vol 15, No 9, p 455-457, 459-461, September, 1975. 4 tab, 9 ref.

Descriptors: *Sewage sludge, *Sludge, *Sewage treatment, Land use, Toxins, Anaerobic digestion, Pollutant identification, *Waste water treatment, Waste disposal, Agriculture, Sludge disposal, Land management.
Identifiers: Land application, Agricultural uses.

The utilization of sewage sludge based upon its composition and properties is studied. It is difficult to define the properties of sewage sludge, since it comes in a wide variety of types, dependent on where it comes from, and what stage of processing it is in. Sludge can be utilized in methane production or fertilizer, both of which have been tried successfully. Proposed uses include wallboard manufacture, smokeless fuel production and metal recovery. It is uneconomical to recover metals from sewage sludge, but the high cost of metals could encourage recovery at the factory, before it becomes sewage. Agricultural uses of sludge have been interrupted since the Industrial Revolution because the concentrations of populations have produced more organic wastes than the land can take back and industrial development has increased the amount of toxins or potential toxins in the sewage, making it undesirable to return it back to the land. Anerobic fermentation processes have been successful in rendering most of these wastes environmentally acceptable. There are four problems and dangers of sludge use in agriculture: distribution, marketing, effects of ex-

ternal circumstances, and quality control of the product and its use. It is necessary to have strict controls and codes concerning the quality of sewage and its application to the land. (Pinto-FIRL)
W76-03328

EFFECTS OF DETERGENT FORMULATION ON WASTEWATER CHARACTERISTICS AND TREATMENT,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
E. E. Shannon.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2371-2383, October, 1975. 11 fig, 7 tab, 17 ref.

Descriptors: *Environmental effects, *Detergents, *Waste water treatment, *Phosphorus, Biodegradation, Biological treatment, Carbonates, Canada, Activated sludge, Metals, Nitrilotriacetic acid.
Identifiers: Citrates.

Results of full-scale detergent substitution tests are presented, from a study: to assess the relationship between detergent formulation and phosphorus removal with calcium, aluminum, and iron salts; to assess the biodegradability of the detergent builder materials when they are subjected to biological treatment, and their impact on the efficiency of the biological waste water treatment process; and to assess the relative effects of four (NTA, citrate, carbonate, and phosphate) laundry detergent formulations on municipal waste water characteristics. These studies were carried out at the Canadian Forces Station, Gloucester, near Ottawa, Canada. It was found that by substituting nonphosphate detergents for existing detergents, an average reduction of 24% in total phosphorus content of domestic waste water was achieved. In a longer duration, larger-scale study, a 56% reduction was observed. Significant diurnal variations in waste water condensed phosphorus, NTA, citrate, sodium, silica, and alkalinity were seen, attributable to use of various detergent formulations. NTA was degraded by the activated sludge system, 61% under NTA substitution conditions. Winter and summer citrate removals over 60% could be expected from a well-operated activated sludge plant. The NTA-mercury, NTA-cadmium and NTA-nickel complexes showed poor degradability in a laboratory activated sludge system; in temperatures under 10 C, reduced NTA degradability may lead to increased metal levels in plant effluent. Detergent-induced increases in NTA or citrate levels did not have any quantifiable effect on phosphorus removal with alum, ferric chloride or lime. (Kramer-FIRL)
W76-03329

TECHNIQUES FOR INDUSTRIAL ODOR CONTROL,
P. N. Cheremisinoff, R. M. Bethea, T. M. Hellman, and O. B. Lauren.
Pollution Engineering, Vol 7, No 10, p 24-31, October, 1975. 6 fig, 4 tab.

Descriptors: *Ozone, *Odor, *Industrial wastes, *Sewage treatment, *Waste water treatment, Oxidation, Chlorine, Adsorption, Absorption, Activated carbon, Treatment facilities, Economics.
Identifiers: Physico-chemical treatment.

The principal methods for controlling odors from manufacturing processes and sewage treatment are outlined. Physical containment of odors may be accomplished either by changing the process producing the odors or by improving maintenance. Various types of oxidation by combustion (direct combustion at 2500 F, thermal oxidation at 1000-1500 F, or catalytic oxidation at 600-900 F) have been popular; however, with rising fuel costs this control technique is no longer economically attractive. A common adsorption material for removal of both inorganic and organic odorants is activated carbon. Most organics with molecular weights greater than 45 and boiling points over 0 C will be adsorbed. Methods of odor removal by absorption were also compared. These could be achieved using ozone, chlorine, sodium hypochlorite, hydrogen peroxide, or potassium permanganate. Ozone has successfully been applied for the control of odors from waste water treatment facilities. Uses include oxidizing sulfides and amines to nonodorous sulfoxides and amino oxides in grit and screening chambers, aeration tanks, vacuum filters, and storage tanks. (Kramer-FIRL)
W76-03330

OXYGENATION AND WASTEWATER TREATMENT.
Environmental Science and Technology, Vol 9, No 10, p 910-915, October, 1975.

Descriptors: *Activated sludge, *Oxygenation, *Municipal wastes, Industrial wastes, Cryogens, Tanks, *Waste water treatment, Biological treatment.
Identifiers: UNOX, OASES, F30, MAROX, Rotating active diffuser(RAD).

A report was made on the widespread use of oxygenation in the activated sludge process and on the four companies which produce oxygenation systems. The oxygenation process allows space savings of one third and increases gaseous solubility about 5 times. It is now used mainly for the treatment of municipal waste waters, but future applications to combined municipal and industrial waste waters and to industrial waste waters with high BOD values are planned. Union Carbide's closed UNOX system was the first developed, and it has about 90% of the oxygenation market in America. There are also UNOX operations in Japan, Europe and the United Kingdom. Air Products OASES is a gas-tight closed reactor and was the first on-stream oxygenation system. Air Products is the chief advocate of cryogenic plants as an oxygen supply system, because of their efficient use of energy. Air Products is prepared to enter the international market. Airco's F30 process uses an open tank and the forced free fall of oxygen. Its units are completely automatic. One is in use at a municipal site and one at an industrial operation. Four MAROX plants, produced by the FMC Corporation, are under construction. The MAROX system uses a Rotating Active Diffuser (RAD). The major benefit of the MAROX system is its operation in open tanks which eliminates costly covers and baffles and entrapment of potentially hazardous gases. Another major benefit is the ability to install a MAROX system in existing basins with virtually no tank modifications. (Beale-FIRL)
W76-03331

THE BIOLOGICAL PURIFICATION OF WASTE WATER IN CARROUSEL PLANTS (DIE BIOLOGISCHE REINIGUNG DES ABWASSERS IN CARROUSELANLAGEN),
F. P. Van Schagen, and J. Jeper.
Wasserwirtschaft, Vol 65, No 10, p 257-262, October, 1975. 7 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Sewage treatment, Aeration, Equipment, Treatment facilities, Flow, Nitrogen, Phosphorus, Nutrient removal, Sludge treatment, Dewatering.
Identifiers: *Carrousel system, Belt presses, Filter presses.

The trend of the costs of construction and energy over the past twenty years has caused the development of increasingly large facilities for sewage treatment, using the Pasveer principles. This development has been significantly affected by the design of the Carrousel system. In this system, surface aerators are used for oxygenation and an orbital flow is generated at the same time, resulting in a series of completely mixed aeration zones and plus flow channels. In addition to the economical advantages of the Carrousel system, the efficiency of nitrogen removal is increased an simultaneous removal of phosphorus with Fe2 can also be effected. After chemical conditioning the aerobically stabilized sludge from a Carrous plant can be dewatered on belt presses or on filt presses. (Orr-FIRL)
W76-03332

WASTE WATER TREATMENT WITH AN SO REMOVAL BY-PRODUCT,
Tri-State Coll., Angola, Ind.
P-W. Lin.
Journal Water Pollution Control Federation, V 47, No 9, p 2271-2280, September, 1975. 11 fig, tab, 14 ref.

Descriptors: *Waste water treatmen *Phosphates, *Turbidity, Economic efficienc Lime, Calcium sulfate, Air pollution, Byproduct Identifiers: Acid neutralization, *Sulfur dioxi removal.

Methods for using the by-products of an mospheric pollution control process in wa water treatment are described. Laborato produced by-product has been demonstrated to suitable for waste water treatment by a neutralization, as a binder for flyash to produ construction materials, and for phosphate and t bidity removal. The by-product contains unsp lime and anhydrous calcium sulfate. The li located in the core of the by-product partic reacts with contaminated water that seeps throu its calcium sulfate shell. The CaO in the product reacts quickly with orthophosphate. T removal efficiency of PO4 from phosphate c taminated water by by-products, as by high-ca um lime, is a function of sedimentation time. T efficiency of PO4 removal from raw waste wa by the by-product is about the same as or be than that by high-calcium lime at the same C dosage level and sedimentation time. The product is better than high-calcium lime in turb ty removal from raw waste water. The use of by-product to remove phosphate and turbi from waste water makes the air pollution con process more economical. Pilot plant studies planned to develop waste water treatment syst to work in coordination with the atmospheric c trol process. (Beale-FIRL)
W76-03333

THE USE OF HIGH-PURITY OXYGEN SEWAGE TREATMENT,
T. P. Lewandowski.
Effluent and Water Treatment Journal, Vol 15, 8, p 401-405, August, 1975. 4 fig, 3 ref.

Descriptors: Equipment, *Sewage treatm *Activated sludge, *Oxidation, *Sludge treatm *Oxygen, Organic loading, Biochemical oxy demand, Dissolved oxygen, *Waste water t ment.
Identifiers: *Unox System, Energy use.

A report was made on the successful use of ygen in the activated sludge process. Advant of the use of high purity oxygen are a reductio land requirements, reduction in power req ments, and an increased ease of operation due highly flocculant and thicker sludge. The U Carbide Corporation had developed a comme viable oxygen system known as Unox. The U system is composed of an aeration tank and a site oxygen generator. Because it achieves M concentrations higher than those of conventi systems, Unox allows for reduced tank vol and commensurate savings in cost. It generate ygen by cryogenic distillation of liquid air, w is most economical for larger plants, or by the process of ambient-temperature separation w uses molecular sieves. The Unox system al for operation at higher organic loadings than mally expected: high quality effluents achieved at 0.5-0.7 kg BOD/d kg MLVSS, a has consistently shown a reduction in the am

urplus sludge produced. This reduction is due to higher concentrations of MLSS which increase the effect of endogenous respiration, and to ore complete oxidation because of the high DO centration which maintains high activity in the tor. The Unox method of process control s power consumption to a minimum, based on enclosure of the reactor tank in a gas-tight r. Due to this arrangement, the horse power ed to generate oxygen is directly related to the (Beale-FIRL)
-03335

YELECTROLYTES IN PRESSURE FILTRAN: EXPERIENCES AT FARNHAM,
. Charlesworth, R. A. Knott, and R. A. Fox.
ient and Water Treatment Journal, Vol 15, No 411-412, 414-415, 417, August, 1975. 2 fig, 2

riptors: *Waste water treatment, *Sewage ment, *Sludge treatment, *Polyelectrolytes, s, Filtration.
tifiers: Filter pressing, Chemical conditioning ts, Polyelectrolyte conditioning agents.

use of polyelectrolytes in the pressure filtraof sludge has the following advantages: low al costs of conditioning systems; possibility educed treatment costs in comparison with tional chemicals, potential of increased filter capacity and shorter pressing times; ease of uct preparation and application; and, eliminaof equipment scaling and corrosion. The use olyelectrolytes in pressure filtration at the ham Water Pollution Control Works (Great in) is discussed. The Farnham plant was nally designed for operation with aluminum rohydrate as the chemical conditioning agent. ever, the larger than design quantity of re- necessary, the severe water/sludge separa- and heavy filter blinding made this chemical ceptable. Tests were performed on a range of electrolytes. Capillary suction time (CST) surements indicated that Zetag 63 was the promising conditioning agent. Fullscale tests irmed the ability of Zetag 63 to satisfactorily ition the sludge for filter pressing. The electrolyte was then put into full-plant opera- Performance with Zetag 63 as an on-line r than batch conditioning system was an effi- system. Tests run with aluminum rohydrate as an on-line system, and with ferric ride and lime as batch systems confirmed that g 63 is a more satisfactory conditioning agent. veen 2 and 3 kg of Zetag 63/ton of dry solids sed at Farnham; the chemical costs are much than they would be for Al203, FeCl, or lime. FIRL)
-03336

RATION IN TERTIARY TREATMENT SEWAGE WATER (GESUI NO SANJIGEN RI NI OKERU ROKA),
atsuura.
shori Gijutsu, (Water Purification and Liquid e Treatment), Vol 16, No 6, p 551-558, 1975. , 3 tab.

riptors: *Tertiary treatment, *Filtration, Tur-, Biochemical oxygen demand, *Waste r treatment, Treatment facilities, Coagula- Chemical precipitation.
ifiers: Alum, Anthracite, Sand filters.

ary treatment of waste water effluent from a ndary treatment facility was studied by a filn technique using anthracite and sand as the tion materials. Filtration efficiency was deterd by the turbidity ratio between the filtered r and sample water. The efficiency increased the increased height of the filtration layer, er filtration speed, and smaller particle sizes tration materials. Based on these preliminary an experimental plant was constructed, in h a filtration tower 300 cm in height with a 60 cm diameter, and double layer of anthracite and sand was employed. The particle size of filtration material used was the effective particle diameter of 1.0 to 2.8 mm for anthracite, and 0.4 to 0.9 mm for sand. The experimental plant had the water treatment capacity of 2.8 to 5.6 cu m/hr depending upon the filtration speed (linear velocity 10 to 20 m/hr). Three techniques were used: direct filtration; coagulation filtration with aluminum sulfate; and coagulation/precipitation/filtration with aluminum sulfate in which the sample water was precipitated upon coagulation with alum prior to the filtration. The last filtration method gave the best results in the quality of treated water. By this method, more than 80% of the original turbidity could be removed and the turbidity in the treated water was less than 5. The efficiency of BOD removal was over 70% to ensure the 10 ppm level of BOD in the treated water. The removal of COD and TOC were not as great; however, 30 to 50% efficiency were obtained. (Katayama-FIRL)
W76-03337

CORRELATION OF VARIOUS MONITORING ITEMS REGARDING POLLUTION SUBSTANCES OF HUMAN WASTES AND TREATED WATER (SHINYO TO SONO SHORISUI NO ODAKU SIBUN NI KANSURU KAKUSHU SOKUTEI KOMOKU KAN NO SOKAN NI TSUITE),
For primary bibliographic entry see Field 5A.
W76-03342

METAL CONCENTRATIONS IN THE SEWAGE, EFFLUENTS, AND SLUDGES OF SOME SOUTHERN ONTARIO WASTEWATER TREATMENT PLANTS,
Canada Centre for Inland Waters, Burlington, Ontario.
For primary bibliographic entry see Field 5A.
W76-03343

COMPARATIVE STUDIES ON THE ACTION OF CHLORINE AND OZONE ON POLIOVIRUSES IN THE REPROCESSING OF DRINKING WATER IN ESSEN (VERGLEICHENDE UNTERSUCHUNGEN UEBER DIE WIRKUNG VON CHLOR UND OZON AUF POLIOVIREN BEI DER TRINKWASSERAUFBEREITUNG DER STADT ESSEN),
For primary bibliographic entry see Field 5F.
W76-03345

THE DESTRUCTION OF PARASITIC RESISTANT STAGES IN SLUDGE BY IRRADIATION WITH LOW ACCELERATING VOLTAGE ELECTRONS (DIE VERNICHTUNG PARASITAERER DAUERFORMEN IM KLAERSCHLAMM DURCH BESTRAHLUNG MIT NIEDERENERGETISCHEN ELEKTRONEN),
K. Enigk, P. Holl, and A. Dey-Hazra.
Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, I. Abteilung Originale Reihe B, Vol 161, No 1, p 61-71, 1975. 1 tab, 8 ref.

Descriptors: *Waste water treatment, *Sludge treatment, *Irradiation, Disinfection, Parasitism, Radiation.
Identifiers: *Ionizing radiation, Electrons.

An investigation was performed on the effect of ionizing radiation on parasitic resistant stages in sludge. An electron beam accelerator can be used for this process. The accelerator is provided with energy from an electric power supply network which can be switched on and off according to the requirements. These units have a large beam capacity and high operating safety. The process is conducted with a continuous flow and at room temperature. The effect of different radiation doses was tested in 13 experiments. An economically acceptable dose of 480 kRad (accelerating voltage: 400 kV, beam current: 10 mA, and irradiation time: 24 sec) can be easily achieved in practical situations. Approximately 97% of the following parasitic stages have been destroyed by a 480 kRad dose: undeveloped eggs of Ascaris suum, Trichuris suis, and Fasciola hepatica; gastrointestinal strongylids of pigs; and, embryonated eggs of Capillaria obsignata and Taenia spec. A few third-stage larvae of Oesophagostomum (Strongylide) of pigs survived 108 sec of irradiation, however, these did not develop to maturity in the definitive host. About 25% of the sporulated oocysts of Eimeria tenella were still infective after 108 sec of irradiation. (Orr-FIRL)
W76-03346

THE REMOVAL OF INORGANIC NITROGEN FROM SEWAGE EFFLUENTS BY BIOLOGICAL DENITRIFICATION,
Water Pollution Research Lab., Stevenage (England).
D. A. Bailey, and E. V. Thomas.
Water Pollution Control, Vol 74, No 5, p 497-512, 1975. 13 fig, 5 tab, 54 ref.

Descriptors: *Nitrogen, *Nitrates, *Nitrites, Sewage, *Sewage effluents, Effluents, *Denitrification, *Biological treatment, *Inorganic compounds, Filters, Sands, Bacteria, Potable water, Anaerobic conditions, Activated sludge, Sludge, *Waste water treatment, Nitrification, Laboratory tests.
Identifiers: Methanol, Molasses, Biological filters, Methaemoglobinaemia, Heterotrophic bacteria.

Drinking water containing nitrate, when ingested by infants, can cause methaemoglobinaemia when the nitrate is reduced to nitrite by certain bacteria present in the infant's digestive tract. Of all nitrification and denitrification processes known, biological processes seem to be the best suited to the conditions and climate of the United Kingdom. Laboratory experiments carried out on biological denitrification are discussed. Certain types of heterotrophic bacteria, which are capable of altering their metabolism in order to use nitrate as a source of oxygen, are used in the processes. It was found that methanol and molasses were the most suitable candidates for sources of carbon; methanol was used in this study. Two different designs or process modifications were used: flooded biological filters and anaerobic or semi-anaerobic adaptations of the activated-sludge process. The flooded filters contained either 25 mm pebbles or 5 mm pebbles. The coarseness had no effect on the efficiency of nitrate removal; at retention periods of one hour, both reduced the nitrate content by about 90%. Temperature had the effect of retarding the process. Nitrate removal at 23C was about 95% and at 7C was about 48%, both after 8 days of operation. After 38 days of operation, 80% was removed at 23C and 71% was removed at 7C. The activated sludge processes are of two types: one in which a specific sludge is developed for denitrification alone and one in which a sludge is used for both nitrification and denitrification at the same time. Testing continues on their relative merit. (Pinto-FIRL)
W76-03347

SPRAY RUNOFF DISPOSAL OF WASTE STABILIZATION POND EFFLUENT,
Environment Canda, Ottawa, Environmental Protection Service (Ontario).
N. Ehlert.
Training and Technology Transfer Division (Water), Research Report No 22, July, 1975. 24 p, 3 fig, 6 tab, 5 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Irrigation, Sprinkler irrigation, Runoff, Water quality, Waste water disposal, Permeability, Soils, Erosion, Waste disposal.
Identifiers: Land application.

An investigation of spray runoff techniques for land disposal of sewage effluents was conducted at the Smithville, Ontario, Canada, waste stabilization pond site. Although the study was originally designed to compare the irrigation-infiltration process to runoff disposal on a heavy clay soil with low permeability, it was also concerned with the runoff operation and effluent quality improvement. The waste stabilization pond effluent was sprayed on an area of soil with a slope of 5 percent, and a permeability, K less than or equal to 0.14 in/hr for two growing seasons. A combined waste stabilization pond-runoff system is capable of reducing the phosphorus loading on a receiving stream by 90%. The hydraulic input to the receiving stream may be reduced by 50% by this system. This system is feasible as long as the rates and duration of application do not result in soil erosion and/or damage to vegetation. The total phosphorus and BOD levels in the runoff satisfied the current discharge standards for sewage treatment plant effluents. However, the suspended solids levels exceeded the current limits, possibly because of minor erosion. (Orr-FIRL)
W76-03348

LAND SPREADING OF INDUSTRIAL WASTE WATER AND THE EFFLUENT FROM A SECONDARY TREATMENT FACILITY,
General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.
W. E. Ward, and D. V. Gray.
Available from the National Technical Information Service, Springfield, Va 22161, as GEPP-127, $3.50 in paper copy, $2.25 in microfiche. Report No GEPP-127, November, 1974. 6 p, 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, Irrigation, Florida, Biological treatment, Nutrient removal, Phosphates, Nitrogen, Biochemical oxygen demand, Waste water disposal, Capital costs, Operating costs, Tertiary treatment.
Identifiers: Land application.

The Pinellas Plant of the General Electric Company, located in west central Florida, treats its industrial and sanitary wastes by land spreading, coupled with a subsurface drainage system. Industrial wastes are discharged to a neutralization facility where the acidic pH is adjusted. Approximately 42,000 gpd are then discharged into the west retention lake. Sanitary wastes are pumped to a 20,000 gpd activated sludge sewage treatment plant. The plant removed 97% of the BOD and suspended solids, but does not remove nitrogen and phosphorus. After chlorination, the sewage is also released to the west retention lake. The combined wastes are retained in the west retention lake for an average of 40 days while being continuously aerated. Water from the west lake is spray applied to the irrigation field. Four-inch perforated polyethylene pipes surrounded by gravel form the underground drainage system. Water collected in the drain sump is directed to the east lake. Discharges from this lake are controlled by a Parshall flume equipped with a recorder and a continuous flow integrator connected to an automatic proportional sampler. The system achieves a 69% reduction in total nitrogen, a 72% reduction in BOD, and a 87% reduction in phosphates. The capital cost of the land spreading system was about $40,000. Operating costs for 1973 were $750 for treating 20 million gallons of effluent. (Orr-FIRL)
W76-03350

REVERSE OSMOSIS OF TREATED AND UNTREATED SECONDARY SEWAGE EFFLUENT,
Eastern Municipal Water District, Hemet, Calif.
D. F. Boen, and G. L. Johannsen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-239 353, $7.75 in paper copy, $2.25 in microfiche. EPA-670/2-74-077, September, 1974. 217 p, 36 fig, 96 tab, 7 ref, 6 append.

Descriptors: *Tertiary treatment, *Waste water treatment, *Reverse osmosis, *Sewage treatment, Membrane processes, Membranes, Equipment, Costs, Water reuse, Groundwater, Recharge.

A pilot plant study was conducted using six commercially designed reverse osmosis (RO) pilot units to determine the feasibility of treating secondary effluent by reverse osmosis in order that the final effluent could be used as an integral part of the Hemet-San Jacinto (California) groundwater recycling program. The use of RO in the groundwater recycling program is relatively expensive in comparison with importing Northern California water. The effective post secondary treatment sequences include: alum clarification followed by sand filtration; sand filtration followed by granular activated carbon treatment; and, alum clarification followed by granular activated carbon treatment. Post secondary effluent treatment significantly reduces the cost of RO, and also lengthens the useful membrane life. The most effective membrane rejuvenation techniques are enzymatic detergent solutions, and a solution of EDTA acid. The use of higher Reynolds number flow conditions effectively retards membrane fouling. The spiral wound configuration and one of the tubular modules exhibited the best overall performance. Costs of reverse osmosis treatment are discussed, and comparisons are made between the different RO modules tested. (Orr-FIRL)
W76-03351

WASTE-PRODUCT POLLUTION OF BODIES OF WATER AND WASTE-WATER PURIFICATION,
For primary bibliographic entry see Field 5B.
W76-03352

ACTIVATED CARBON: OLD SOLUTION TO OLD PROBLEM, PART II,
For primary bibliographic entry see Field 5F.
W76-03443

ESTIMATING SLUDGE PRODUCTION AIDS IN FACILITIES DESIGN, PART II,
Mississippi State Univ., Mississippi State.
L. D. Benefield, C. W. Randall, and J. H. Sherrard.
Water and Sewage Works, Vol 122, No 9, p 100-102, September, 1975. 4 fig, 1 tab, 13 ref.

Descriptors: *Treatment facilities, *Design criteria, *Activated sludge, *Waste water treatment, Anaerobic digestion, Mathematical studies, Model studies, Analytical techniques, Estimating equations.

As the second part of a two-part series on estimating the production of sludge for the design of treatment facilities, a sample problem is presented. This involves the estimation of the volume of raw sludge from a completely mixed activated sludge plant treating a municipal waste water flow of 10 mgd, using anaerobic digestion for sludge stabilization. It is assumed that the influent waste water temperature is 20 C; several other waste water is characteristics after grit removal are also outlined. A set of fourteen computations is presented, including: the volume of sludge removed during primary clarification in one day; the percent of BOD5 reduction during primary clarification; the observed yield coefficient, associated with a mean cell residence time of 16 days; the activated sludge production in one day; the concentration of the waste sludge when wasting is from the sludge line; the volumetric sludge wasting rate; volatile fraction of primary plus activated sludge mixture; the required digestion time for a digestion temperature of 80 F; the percent reduction in volatile solids during digestion; the weight of digested sludge produced in one day; the volume of digested sludge produced in one day; the volume of supernatant produced in one day; the influent BOD5 considering supernatant recycle; and the influent suspended solids concentration considering supernatant recycle. (Kramer-FIRL)
W76-03444

PRESENT AND FUTURE REQUIREMENTS OF THE CHLOR-ALKALI INDUSTRY FOR EFFECTIVE POLLUTION CONTROL,
Crawford and Russel, Inc., Stamford, Conn.
W. C. Gardiner.
In: Electrochemical Contributions to Environmental Protection, Theodore R. Beck, et al., editors. The Electrochemical Society, Inc., Princeton, New Jersey, 1972, p 16-28. 3 fig, 6 tab, 6 ref.

Descriptors: *Chlorine, *Alkalis(Bases), *Industrial wastes, *Chemical wastes, *Pollution abatement, Mercury, Sulfides, *Waste water treatment, Sludge treatment, Sludge disposal, Brines, Air pollution, Sodium compounds, Cooling water, Gases, Industries, Pollutants.
Identifiers: *Chlor-Alkali Industry.

In the United States, chlorine is produced in diaphragm, mercury, and Downs sodium cells. Concentrated brine is purified by addition of alkaline sodium carbonate and sometimes a barium salt, and filtered. For sodium and some mercury cell processes, purified brine is evaporated to obtain pure salt. Sulfate is discarded as sodium sulfate-sodium chlorine solution, sodium sulfate, barium sulfate, or calcium sulfate. Wastes from these processes are chlorine, sodium hydroxide, sodium chloride, sulfuric acid, hypochlorites, chlorinated hydrocarbons, calcium carbonate, magnesium hydroxide, sodium sulfate, asbestos filter aids, mercury, lead, calcium oxide, sodium carbonate, calcium chloride, sodium-calcium sludge, graphite, rubble, and sludge. Wastes are controlled by separating cooling water from process water, recycling process water, settling ponds, and burying solids. Sodium-calcium sludge is returned to sodium cells. Methods of controlling mercury loss in products, sewers, atmosphere, and solid wastes are discussed. A flow sheet illustrates sulfide treatment of liquid wastes in chlorine plants. Processes using ion exchange and/or chelating agents for mercury recovery are described. Improvement of known methods, better mercury controls, mercury inactivation in solid wastes, mercury removal from air with negligible pressure drop, diaphragm cell caustic purification, new diaphragm material, and a permanent chlorine anode are still needed. (Buchanan-Davidson--Wisconsin)
W76-03497

5E. Ultimate Disposal Of Wastes

ONE PRIVATE PLANT TREATS OIL, CHEMICAL RESIDUES IN DENMARK,
For primary bibliographic entry see Field 5D.
W76-03073

ALTERNATIVE PROBLEM: COMMUNAL OR INDIVIDUAL PURIFICATION OF THE WASTE WATERS GENERATED BY THE BIOLOGICAL INDUSTRIES IN THE LOUVAIN AREA (PROBLEMMSTELLING VAN HET ALTERNATIEF: GEMEENSCHAPPELIJKE OF INDIVIDUALE ZUIVERING VAN HET AFVALWATER VAN DE BIO-INDUSTRIE ROND LEUVEN),
For primary bibliographic entry see Field 5D.
W76-03085

TREATMENT AND DISPOSAL OF EFFLUENT FROM THE WOOL TEXTILE INDUSTRY,
For primary bibliographic entry see Field 5D.
W76-03095

FECTS OF GRAZING ON INFILTRATION TES IN WASTE WATER SPRAY FIELDS,
icultural Research Service, Morgantown, W. Plant Science Div.
primary bibliographic entry see Field 5D.
6-03124

FECTS OF OCEAN DISPOSAL ACTIVITIES MID-CONTINENTAL SHELF ENVIRON-NT OFF DELAWARE AND MARYLAND,
ironmental Protection Agency, Annapolis, Annapolis Field Office.
primary bibliographic entry see Field 5C.
6-03175

NUAL SUMMARY OF RESEARCH RESULTS R FISCAL YEAR 1974, MESA NEW YORK HT PROJECT.
ional Oceanic and Atmospheric Administra-, Boulder, Colo. Marine Ecosystems Analysis gram Office.
primary bibliographic entry see Field 2L.
6-03186

N DUST FROM CEMENT FACTORIES FOR CUUM FILTER PROCESSING OF SEWAGE DGE,
nsylvania State Univ., University Park. Dept. oil Chemistry.
primary bibliographic entry see Field 5D.
6-03214

CULAR TANK SCRAPER.
primary bibliographic entry see Field 8C.
6-03222

UIPMENT FOR DEWATERING WASTE EAMS,
r-Oliver, Inc., Stamford, Conn. Environmental hnology.
primary bibliographic entry see Field 5D.
6-03227

E OF WASTEWATER BACTERIA AND SUSES IN SOIL,
lor Coll. of Medicine, Houston, Tex. Dept. of logy and Epidemiology.
primary bibliographic entry see Field 5B.
6-03251

USE OF SEWAGE EFFLUENT AND DGE,
primary bibliographic entry see Field 5D.
6-03326

ING UP TO SLUDGE DISPOSAL IN NEW SEY,
emley.
post Science, Vol 16, No 4, p 26-27, July-Au-, 1975.

criptors: *Waste disposal, *Sludge disposal, science, Methane, Feed lots, Marshes, Soil amination, Dredging, *Farm wastes, *New ey.
tifiers: *Soil conditioners.

on-going test has been conducted for the past e years at six sites in New Jersey to determine ated sludge can be used as a soil conditioner. study is one of the most extensive of this type e world. Some off-site contamination was ob-ed from the site which was receiving sludge at pplication rate of 40 ton/acre/yr. The use of ge as a soil conditioner at a 20 ton/acre/yr ap-tion rate is showing promise. Successful im-entation of this type of disposal method could ce by one-half the cost of disposing of sludge ndfills. Manure from animal feedlots as an omical source of methane gas is being investigated in Texas and Colorado. Bio Gas of Colorado, Incorporated, has built a plant to make 4 million cu ft of gas daily from 450,000 tons of cow manure yearly. Era is building a methane producing plant adjacent to a cattle feedlot in Deaf Smith County, Texas. A tidal marsh that is alternately flooded by water and then exposed to the sun and air and that has the ability to withstand and absorb wave action has been created near Hambleton Island, Maryland. An intertidal sand flat was first built and then planted with 60,000 seedlings. The experiment is part of a five year plan to explore new, ecologically acceptable uses for part of the 380 million cubic yards of sediment dredged up yearly by the corps. (Orr-FIRL)
W76-03341

SPRAY RUNOFF DISPOSAL OF WASTE STABILIZATION POND EFFLUENT,
Environment Canda, Ottawa, Environmental Protection Service (Ontario).
For primary bibliographic entry see Field 5D.
W76-03348

LAND SPREADING OF INDUSTRIAL WASTE WATER AND THE EFFLUENT FROM A SECONDARY TREATMENT FACILITY,
General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.
For primary bibliographic entry see Field 5D.
W76-03350

USE OF JET PUMPS IN MARINE WASTE DISPOSAL,
Technion - Israel Inst. of Tech., Haifa.
Y. Argaman, M. Vajda, and N. Galil.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 101, No EE5, Proceedings Paper 11639, p 703-711, October 1975. 7 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Jets, *Diffusion, *Pumps, *Sewage disposal, *Waste water disposal, Environmental engineering, Model studies, Oceans, Waste disposal, Waste dilution, Stratification, Laboratory tests.
Identifiers: *Marine engineering.

The prime objective of a marine waste disposal installation is to maximize the physical dilution of wastewater with seawater. Very often the formation of a submerged plume is desirable. Application of the jet pump principle for achieving these objectives was investigated in a laboratory model. Tests were performed in both homogeneous and stratified environments. The experimental results and a theoretical analysis showed that in a homogeneous environment the use of a jet pump results in a significant increase of the initial dilution. Under stratification conditions, the use of a jet pump increased the probability of forming a submerged plume. However, the dilution obtained under these conditions was considerably lower compared to a simple jet. (Lardner-ISWS)
W76-03379

DO HEAVY METALS PREVENT THE AGRICULTURAL USE OF MUNICIPAL SLUDGE,
Royal Danish School of Pharmacy, Copehagen.
S. E. Jorgensen.
Water Research, Vol 9, p 163-170, 1975, 13 fig, 5 tab, 16 ref.

Descriptors: *Heavy metals, *Agriculture, *Sludge disposal, Groundwater, *Soil disposal fields, Soil treatment, Soil-water-plant relationships, Humus.

The chemical binding of heavy metals on different samples of soil was found. The pollution of heavy metals in soils by use of sewage sludge can be controlled by maintaining the pH at 7.0 or more and applying sludge preferably on soil with a high content of humus and clay. More than 200 tons of municipal sewage sludge can be applied per acre total, e.g. 20 tons per year over a 10 year period, without any danger. In most cases, lead is the metal limiting the amount of sludge that can be used due to its possible contamination of ground water. (Hoyle-Vanderbilt)
W76-03409

ORGANIC CHEMICALS IN DRINKING WATER,
California State Dept. of Health, Berkeley. Water Sanitation Section.
For primary bibliographic entry see Field 5F.
W76-03428

5F. Water Treatment and Quality Alteration

WATER SUPPLIES FOR LOW-INCOME COMMUNITIES IN DEVELOPING COUNTRIES,
Birmingham Univ. (England). Dept. of Civil Engineering.
R. G. Feachem.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 101, No EE5, Proceedings Paper 11608, p 687-702, October 1975. 6 tab, 16 ref, 1 append.

Descriptors: *Water supply development, *Water quality control, *Water requirements, *Water quality, Hydraulics, Water allocation(Policy), Water supply, Cities, Diseases, Planning.
Identifiers: *Developing countries, *Water impacts, Water collection systems.

Examination of data on the availability of adequate water supplies in developing countries revealed an alarming state of affairs. This paper presented and analysis of the potential impact of a water supply in a poor tropical community and examined techniques for the quantification of this impact. Special attention was paid to the impact of a supply on the water collection journey (time and energy saving) and to the anticipated improvements in community health. A classification of water-related disease was presented and the effect of water supplies on various water-related infections was analyzed. A comprehensive table, showing the principle features of the water-related diseases, was included. It was shown how the analysis of water supply impacts, and in particular impacts on water collection and health, can facilitate improved designs and more rational resource allocation for water supply programs in developing countries. (Lardner-ISWS)
W76-03114

ECONOMIC ASSESSMENT OF AN ACTIVITY ANALYSIS MODEL FOR WATER SUPPLY PLANNING,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5D.
W76-03163

WATER PURIFICATION MEMBRANES AND METHOD OF PREPARATION,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
For primary bibliographic entry see Field 5D.
W76-03171

WATER MANAGEMENT IN ENGLAND: A REGIONAL MODEL,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 6B.
W76-03207

ESTUARY TO BE STUDIED AS D.C. WATER SOURCE,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.
A. R. Jacobson.
Public Works, Vol 106, No 10, 122, October, 1975. 1 fig.

Descriptors: *Water reuse, *Waste water treatment, *Treatment facilities, *Pilot plants, Design criteria, *Estuaries, Recycling, Operating costs, Capital costs, Research and development, District of Columbia, *Potomac River.
Identifiers: *Waste water reuse, Washington(DC).

An indirect waste water reuse plan is being considered to supplement the water supply of the metropolitan Washington, D.C. area. An experimental plant is being designed with a capacity of one mgd, to provide facilities and equipment for the study of several types of treatment processes. The experimental plant will test the treatment of water from the Potomac River Estuary, which receives Blue Plains waste water effluents. A central monitoring and control center will be available to sample the processes, which include: pretreatment, such as microscreening; coagulation, flocculation, and sedimentation; rapid sand filtration,; activated carbon adsorption; and final treatment via ozonation or chlorination, or by the choice of reverse osmosis, electrodialysis, or ion exchange, followed by disinfection. Estimated design and construction costs, are about $6 million and operating costs, including research, are expected to be $1.4 to $1.7 million per year. (Kramer-FIRL)
W76-03208

PLASTIC PUMP HANDLES ACID USED IN WATER SYSTEM.
For primary bibliographic entry see Field 8C.
W76-03217

HYGIENIC ASSESSMENT OF THE EXISTING TECHNOLOGY OF DRINKING WATER TREATMENT AND CERTAIN MEANS OF ITS IMPROVEMENT, (GIGIENICHESKAYA OTSENKA SUSHCHESTVUYUSHCHEY TEKHNOLOGII OCHISTKI PIT'EVOY VODY I NEKOTORYE PUTI EE ULUCHSHENIYA),
T. A. Nikolaeva, and I. P. Pletnikova.
Gigiena i Sanitariya, No 7, p 29-33, 1975. 1 tab.

Descriptors: *Water treatment, *Water works, *Treatment facilities, *Potable water, Pollutants, Ozone, Activated carbon.

Experimental and field investigations have been performed to determine the barrier role of water works. The capacity of water treatment facilities for removing chemical contaminants is very limited. No effective means for improving the existing methods of water treatment can be suggested at this time. Ozone treatment of potable water is not a universal means of removing chemical pollutants. The most effective and promising technique is activated carbon adsorption. (Orr-FIRL)
W76-03220

THE EFFECT OF CIRCULATION BAFFLES ON THE OXYGENATING EFFECT OF AERATORS OPERATING IN HORIZONTAL POSITION (WPLYW PRZEGRODY CYRKULACYJNEJ NA EFEKTY NATLENIANIA URZADZEN PRACUJACYCH NA WALE W POZYCJI POSIOMEJ),
W. Zymon.
Gaz, Woda i Technika Sanitarna, Vol 49, No 6, p 204-206, June, 1975. 5 fig, 1 tab, 8 ref.

Descriptors: *Flow, *Oxygenation, Analytical techniques, Hydrodynamics, Laboratory tests, *Aeration, Water purification, Mixing.
Identifiers: *Aerators, Oxygenation rates.

Hydrodynamic analysis of liquid flow in oxygenation tanks and ditches, equipped with horizontal, rotary aerators, may be used to demonstrate the adverse effects of a poor circulation pattern on oxygenation rate, purification process, and power consumption. The principal deficiency discovered was the formation of a partial closed-cycle flow pattern in the immediate vicinity of the aerator which quickly becomes saturated with oxygen. This prevents efficient utilization of the entire available volume. Tests conducted in an experimental tank (dimensions 1.35 x 0.7 x 0.32 m) equipped with a 0.316 m diameter aerator, with flat blades 0.03 m wide, demonstrated that installation of a baffle at a depth of 0.03 to 0.05 m below the aerator, and inclined at an angle of 10 to 35 degrees with respect to the water surface, will change the circulation pattern and result in a good mixing of the entire volume of the chamber. The oxygenation rate becomes then a linear function of the depth of immersion and of rotational velocity of the aerator. Increases of 32 to 80% in oxygenation capability have been achieved, resulting in a possible efficiency of 5000 g 02/kWh. (Czorpita-FIRL)
W76-03229

MODIFICATIONS IMPROVE CHLORINE CONTACT CHAMBER PERFORMANCE, PART I,
Worcester Polytechnic Inst., Mass. Dept. of Civil Engineering
F. L. Hart, R. Allen, J. DiAlesio, and J. Dzialo.
Water and Sewage Works, Vol 122, No 9, p 73-75, September, 1975. 4 fig, 2 tab.

Descriptors: *Chlorine, *Water treatment, *Disinfection, Operating costs, Analytical techniques, Hydraulics, Pollutant identification.
Identifiers: *Chlorine contact tanks.

Studies have been conducted on modifications of the standard rectangular chlorine contact tank in order to improve the hydraulic efficiency. The two major variables in chlorine disinfection are concentration and time, and effective treatment is obtained by providing adequate dosage concentrations for the proper contact periods. While increasing dosages has been used as a method in the case of poor contact time, this practice has limitations because of problems caused by corrosive conditions experienced from too high concentrations, increased operating costs, and the inefficient utilization of chlorine. A successful chlorine contact chamber should achieve required disinfection levels as well as low operating costs and the discharge of an effluent safe for future uses. Two test evaluation methods are described for the modification of the standard chlorine contact tank to provide a more desirable hydraulic condition (plug flow). This modification is directly related to an increase in disinfection capability. Analysis was made of quantitative conventional dye tracer output response functions and qualitative evaluation of stream line flows. In order to modify the contact chamber, hydraulic performance of the prototype and unmodified chambers must be evaluated; areas of poor plug flow performance must be identified; and a series of systematic modifications can then be installed. Graphical presentations of the output response function data are presented; these demonstrated a hydraulic similarity between the model and field chlorine contact chambers. (Kramer-FIRL)
W76-03231

STUDY OF COAGULATION OF WATER BY FLUOROMETRY (ETUDE DE LA COAGULATION DES EAUX PAR FLUOROMETRIE),
Laval Univ., Quebec. Dept. of Civil Engineering.
J-B. Serodes, and A. Soucy.
Revue Canadienne de Genie Civil, Vol 2, No 3, p 253-261, September, 1975.

Descriptors: *Water treatment, Analytical techniques, *Fluorometry, Treatment facilities, *Coagulations, Aluminum, Ions, Hydrolysis, Temperature, *Pollutant identification.
Identifiers: Coagulants, Aluminate ion, Aluminum ion.

A fluorometric method has been used to determine residual aluminum salts used as coagulants in water treatment. With this method, the influence of such factors as temperature on the hydrolysis of these salts may be evaluated. It was found that the yield of hydrolysis was lessened by low temperatures and that aluminum ion is more sensitive than aluminate ion. The method described is suggested for detecting problems in the operation of water treatment plants. (Kramer-FIRL)
W76-03239

MONITORING LAB GIVES CITY THE JUMP ON SAFE DRINKING WATER REGULATIONS,
Inglewood Water Dept., Calif.
K. D. Duke.
The American City and County, Vol 90, No 10, p 70-71, October, 1975.

Descriptors: *Monitoring, *Water quality, *Laboratory tests, *Water treatment, Treatment facilities, Heavy metals, Pollutant identification, Capital costs, Cities, Legislation, Equipment, Personnel, California.

The city of Inglewood, California with a population of 90,000, has developed a complete, well equipped quality monitoring laboratory. Tests are being conducted on heavy metals, trace pollutants, physical parameters, and bacteria. The laboratory personnel include a full-time chemist, a paid student, and a student being trained under the federal CETA program. A water service inspector also conducts field checking for cross-connections. The capital costs for the laboratory were about $44,000, including casework and equipment purchased over a five year period. For fiscal year 1975-1976, the approved budget was $67,000. The city relies on some ground water sources but mainly on imported water for the Metropolitan Water District of Southern California (MWD). Because of the danger of an earthquake, the community has passed a bond issue to improve its own water system by building new water lines and storage facilities as well as a new water treatment plant. The treatment plant is planned to begin operation in January 1977. The laboratory will play a major role in monitoring the processes involved with the facility. Additionally, when new drinking water regulations come into effect, Inglewood will be responsible for its own water quality and will continue monitoring its wells and treatment facilities. (Kramer-FIRL)
W76-03240

THE PLANNING AND CONSTRUCTION OF POTABLE WATER WORKS IN RELATION TO THEIR OPERATION (EL PROYECTOR Y CONSTRUCCION DE OBRAS DE AGUA POTABLE EN RELACION CON LA OPERACION),
G. Flores-Sousa.
Recursos Hidraulicos, Vol 4, No 2, p 204-21, 1975. 4 fig.

Descriptors: *Water treatment, *Water works, Foreign research, Planning, Construction, Operation, *Mexico, Water supply, Potable water.

The General Direction of the Operation of Potable Water and Sewerage Systems of Mexico feels that there is a need for reviewing the demand, custom, economic possibilities, and standards of operation of water treatment in order to obtain directive data, and further experience. This information will be used to perform projects and construct water works in a more economical and functional manner to provide for the optimum utilization of the available hydraulic, technical, and financial resources. Rigid standards to be followed in the planning and construction of water works are not desirable. Instead, engineers and technicians in the field of water engineering should conscientiously study the problems and formulate specifications

nstructions applicable to Mexico and other oping countries. The General Direction of the ation of Potable Water and Sewerage ms has established a procedure of systematic vation in towns of the Republic with dif- living conditions, number of inhabitants, te, type of water supply, and socioeconomic ts. This information will be made available to ners of new water works and others con- d with the improvement of existing treatment ies. The information should also identify in which operation can be improved and cur- used techniques can be modified or adapted. FIRL)
03253

Y OF FLUORINE IN THE UKRAINE AND ENDEMIC FLUOROSIS CONNECTED REWITH (IZUCHENIE FTORA NA AINE I SVYAZANNOGO NIM EN- ICHESKOGO FLYUROZA),
rimary bibliographic entry see Field 5C.
03254

METROPOLITAN WATER DISTRICT OF THERN CALIFORNIA REPORT FOR THE AL YEAR JULY 1, 1973 TO JUNE 30, 1974.
ern California Metropolitan Water District, ngeles.
rimary bibliographic entry see Field 4A.
03285

ER TREATMENT.
rimary bibliographic entry see Field 4A.
03288

CTS OF WATERWORKS PUMPING T DESIGN,
rimary bibliographic entry see Field 8C.
03324

ER AUTHORITIES' RESEARCH NEEDS,
rimary bibliographic entry see Field 5D.
03325

OR RASH REGIONALIZATION,
Capen.
ican Water Works Association Journal, Vol 10, p 588-590, October, 1975. 1 fig, 1 tab, 19

iptors: *Water supply, *Water rates, slation, Administration, Sewers, State ju- ion, *Regional development, Water treat-

fiers: Water rate manual.

on the populations, annual water supply es, and revenue for twenty-five large United cities were compared. A surcharge is ally appled to rates for city water sold to sub- or outside areas, and cities have had dif- es in obtaining their desired compensation. ne cases, a district or regional administration elped to overcome outmoded legislation. The of Philadelphia and Pittsburgh were cited, a city is not serving water to noncity areas. utilities (such as in Louisville and Nashville) expanded to include both water and sewer tions. The effects of a lack of standards and escalation controls has been felt in water ontroversies in New York and Chicago. In Jersey, state, district, city, and suburban of- have overlapping and conflicting jurisdic- a new water rate manual for sales and others, ing both individual city control and regional trict control is greatly needed. More ap- ate legislation for water rates was also mended. (Kramer-FIRL)
03327

GET THE WATER OUT OF ALUM SLUDGE,
W. S. Foster.
The American City and County, Vol 90, No 9, p 83-85, September, 1975. 3 fig.

Descriptors: *Water treatment, *Sludge treatment, *Dewatering, Coagulation, Filtration, Chlorination, Surface water, Diatomaceous earth, Construction costs, Operating costs, *Treatment facilities, Georgia.
Identifiers: *Pneumatic ejectors, *Alum sludge.

A description was made of Atlanta's new Hemphill Settled Solids Treatment Plant. It represents a new aspect of water treatment necessitated by stricter standards of stream purity. Its processes apply to any system drawing from surface sources and treating the water by coagulation and filtration. This plant uses three clarifier-thickeners designed for a surface overflow rate of 1.75 gpsf/min, although experience indicates that a lower rate is more effective. In chemical feed tanks the sludge pH is raised to permit dewatering which occurs in pressure filters. These utilize diatomaceous earth and produce a cake of 46% solids, which is transported to a landfill area, and a filtrate of less than 10 ppm suspended solids, which is run through a chlorine contact chamber and returned to the plant's raw water reservoirs. Innovative features include sludge transport through pneumatic ejectors, important because the sludge this plant treats is abrasive and damages equipment with any moving parts. This transport system can move sludge of varying consistencies and eliminates spillage. Operating costs may be as much as $30.86/ton solids removal. The EPA contributed 33% of construction costs. For each filter run, 62,000 gallons of water are returned to the plant's reservoirs. A use is being sought for the dewatered sludge. (Beale-FIRL)
W76-03334

DDC PROCESS OF SAIKAWA WATER TREATMENT PLANT IN KANAZAWA CITY,
H. Aoki, and H. Kamei.
Suido Kyokai Zasshi, (Journal of Japan Water Works Association), No 487, p 20-30, 1975. 8 fig.

Descriptors: *Water treatment, *Control systems, *Filtration, *Computers, *Sedimentation, Water purification, Chlorine, Monitoring, *Treatment facilities.
Identifiers: Japan, *DDC system.

The DDC system of the Saikawa water purification plant, Japan, is described. The plant has a maximum treatment capacity of 161 cu km/day with one water basin, three rapid agitating basins, six sedimentation basins, nine high speed filtering basins, one chlorine mixing basin and two water purification basins. Chemicals used for water treatment included chlorine as a disinfectant, PAC as an aggregating agent, and sodium alginate as a co-aggregating agent and alkali. An SPC long distance control system is used for monitoring water piping and the water reservoir while the DDC system is used for monitoring the water purification and water distribution basins. The DDC system consists of a central operation-treatment machine, man-machine communication devices, a detection apparatus and an on-spot control board. The system controls the water level, water quanity and quality, application of chemicals and disinfection, and the automatic operation of machinery. Minor loop control of the process for the DDC system is conducted by PID feedback control. (Su-FIRL)
W76-03339

DEVELOPMENTS IN PUMPING SYSTEM, A TWO YEARLY REVIEW, PUMPING AND THE EMPINGHAM SCHEME.
For primary bibliographic entry see Field 8C.
W76-03340

COMPARATIVE STUDIES ON THE ACTION OF CHLORINE AND OZONE ON POLIOVIRUSES IN THE REPROCESSING OF DRINKING WATER IN ESSEN (VERGLEICHENDE UNTERSUCHUNGEN UEBER DIE WIRKUNG VON CHLOR UND OZON AUF POLIOVIREN BEI DER TRINKWASSERAUFBEREITUNG DER STADT ESSEN),
O. Thraenhart, and E. Kuwert.
Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Abteilung 1: Originale, Reihe B: Hygiene, Praeventive Medizin, Vol 160, No 4/5, p 305-341, 1975. 16 fig, 13 tab, 51 ref.

Descriptors: *Ozone, *Chlorine, *Water treatment, *Potable water, Water supply, Hydrogen ion concentration, Viruses, Sewage, Disinfection, Waste water treatment, Costs.
Identifiers: *Essen(Germany), *Poliovirus, Redox-potential.

In order to decide whether to change the method of potable water supply treatment from chlorine to ozone in Essen, Germany, the comparative inactivation of polio virus type I strains by means of chlorine and ozone were evaluated under laboratory conditions. Polio virus type I was chosen because of its epidemiological behavior and high stability in drinking water and sewage lines. The virus-inactivating effect of specific quantities of disinfectants in water without redox-potential (double-distilled water), water with low defined redox-potential (double-distilled water + KOH), previously chlorinated water with a residual chlorine content of 0.03 mg chlorine per liter (tap water), and water with a high redox-potential (well water from the drinking water plant) were examined. Time course studies were performed, both with chlorine and ozone, to evaluate the characteristics of the inactivation procedure. Results took into account the quantitative differences in effect, and confirmed that chlorine and ozone can be considered equivalent in their action of virus-disinfection. The initial rate and the kinetics of virus disinfection were identical, and the effectiveness of both disinfectants was dependent upon the condition of the water (such as redox-potential, pH) to a water supply in Essen, Germany, could not be drawn on the basis of these virological experiments. That decision must be based on facts such as relative costs and practicability of ozonization on a large technical scale. (Kramer-FIRL)
W76-03345

USE OF REVERSE OSMOSIS AND ULTRAFILTRATION FOR REMOVING MICROORGANISMS FROM WATER,
Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Sanitary Sciences Div.
J. A. Hinterberger, D. S. Lindsten, and A. Ford.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-A008 331, $5.00 in paper copy, $2.25 in microfiche. Report No 2111, September, 1974. 81 p, 32 fig, 18 tab, 11 ref.

Descriptors: *Water treatment, *Potable water, *Reverse osmosis, Membrane processes, Membranes, Pilot plants, Bacteria, Potomac River.
Identifiers: Ultrafiltration.

An investigation of the efficiency of reverse osmosis (RO) and ultrafiltration to remove bacteria from water in order to produce safe potable water was conducted. Raw polluted Potomac River water and Fort Belvoir, Virginia, tap water enriched with test organisms were used as the test water. Reverse osmosis and ultrafiltration mem branes are very effective in removing bacteria from water. RO membranes in full-scale pilot plants initially has a nearly 100% rejection rate which decreased depending on feedwater quality, operating time, and length of shutdown period. Commercial RO membranes are not perfect, and

bacteria can pass through the leaks. The difference in rejection rates of microorganisms between laboratory equipment using membrane disks, and rejection rates of full-scale pilot plant is due to the large difference in membrane area which has a greater risk of leaks. Chlorination of the feedwater so that there is a free chlorine residual in the product water is recommended to counteract or minimize the biological degradation of the cellulose acetate membrane and to suppress bacterial growth on the membrane surface. It is necessary to also post chlorinate the product water. An enrichment of bacteria in technical equipment resulted from long interruptions overnight or on weekends. A combined water purification system of RO and ultrafiltration will achieve an excellent potable water quality. However, the enrichment effect causes breakthrough of microorganisms. In order to make this treatment safe, it is necessary to prevent enrichment. (Orr-FIRL)
W76-03349

THE PROCEEDINGS OF A NATIONAL SYMPOSIUM ON THE STATE OF AMERICA'S DRINKING WATER.
North Carolina Water Resources Research Inst., Raleigh.
September 26-27, 1974, held at University of North Carolina at Chapel Hill, NC, 262 p. Edited by F. Eugene McJunkin, North Carolina State University, Raleigh, NC 27607, $8.00.

Descriptors: Water quality, Public health, *Water supply, *Water treatment, Symposia, Water rates, Legislation, *Enteric bacteria, Viruses, Conferences, *Potable water, Water sources.
Identifiers: *Safe Drinking Water Act, Enteric viruses, Small water supplies, Waterborne diseases.

Drinking water is undoubtedly the first ranking priority in water management; certainly, this is because of health considerations. Yet, drinking water has received too little attention on the national scene outside the realm of professional societies like the American Water Works Association. This symposium was sponsored by Duke University, North Carolina State University, University of North Carolina at Chapel Hill, and the U. S. Environmental Protection Agency for the purpose of increasing the level of understanding of the many aspects associated with insuring safe driking water. Twenty-one presentations are included on the impact of the Safe Drinking Water Act, health relationships of today's water supplies, water supplies for rural areas and small communities, and state of the art of water supply. (See W76-03423 thru W76-03442)
W76-03422

IMPACT OF THE SAFE DRINKING WATER ACT,
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
J. H. McDermott.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 3-18. 3 tab.

Descriptors: *Potable water, *Legislation, Water quality standards, Water supply, Water treatment, Treatment facilities, Federal jurisdiction, Research.
Identifiers: *Safe Drinking Water Act, Congress.

The Safe Drinking Water Act was signed into law in December, 1974. However, further legislation is being debated because current standards have not been uniformly applied. A reassessment of the current technology is needed, particularly with respect to small systems. Data for the past few years were collected and indicated that many drinking water systems lack adequate collection and treatment facilities, have poorly trained and/or part-time employees, are infrequently inspected by the state or county, and are poorly operated and maintained. Additionally, there is a substantial lack of public awareness of the problems. The drinking water standards were defined in terms of the roles of federal, state, and local utilities. Technical assistance has been given by the federal government for research related to the 'cause, diagnosis, treatment, control, and prevention of physical and mental disease' of man, and to providing a dependable safe drinking water supply. Pending legislation both in the Senate and in the House was discussed. It was noted that the House bill would authorize treatment standards in cases where lack of measurement techniques and/or firm health effects data would otherwise prevent the establishment and enforcement of a constituent standard. It was concluded that the most immediate legislative challenge is to extend or modify existing practices for application in small systems. In addition, it was hoped that the research conducted under the Safe Drinking Water Act will improve the quality and dependability of United States water supplies. (See also W76-03422) (Kramer-FIRL)
W76-03423

THE DEVELOPMENT AND APPLICATION OF THE 1974 DRINKING WATER STANDARDS,
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
R. D. Lee.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 19-33. 1 tab, 4 ref.

Descriptors: *Potable water, *Legislation, *Public health, *Water quality standards, Water supply, Water treatment, Water pollution effects, Monitoring, Pollutant identification, Turbidity, Mercury.

Provisions of the 1972 Safe Drinking Water Standards were discussed, viewing the act as a revision of the 1962 Public Health Service Drinking Water Standards. The proposed new standards with the greatest impact on water supply utilities and regulatory agencies were said to be: the reduction of the turbidity limit from 5 units to one unit and its reclassification as a health-related constituent; the addition of a mercury standard of 2 micrograms per liter; the addition of several pesticides for which monitoring will be required; and, the concept of radiation dose to replace the previous concentration of radioactivity in water. A more detailed list of changes in the new standards is provided in tabular form. Changes were made in standards for bacteria, chlorine residual, viruses, trace substances, and radioactive substances. The impact of the new standards and guidelines on water utilities is dependent upon procedures for surveillance and monitoring as defined by the individual states. The Standards emphasize the continuing need to evaluate alternative sources and to choose those which present the minimum risk of contamination by waste waters with impurities which might be a health hazard. Over a seven year period, analyses of all of the 240,000 water systems (40,000 conventional and 200,000 which serve the travelling public) in the United States are planned. Additional research on health effects and treatment technology is needed before standards can be developed that can adequately protect human health on a long range basis. (See also W76-03422) (Kramer-FIRL)
W76-03424

NEW ENVIRONMENTAL HEALTH PROBLEMS IN WATER SUPPLY,
National Inst. of Environmental Health Services, Research Triangle Park, N.C.
D. P. Rall.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 34-37.

Descriptors: *Chemical industry, *Toxicit *Public health, *Environmental effects, *Potab water, Pollutant identification, Analytic techniques.

The possible toxic effects of newly produc chemicals on public health, when introduced i public water supplies, are of great conce Because between 500 and 1,000 new chemicals a introduced into commerce each year, the potent harm of these has not been measurable. Becau there is no systematic mechanism for knowing t processes by which these new chemicals produced, it cannot be predicted when int mediates and by-products will appear in the vironment. Two well-known examples of this polychlorinated biphenyls, which were acciden discovered in carcasses of birds, and phthalic a esters, which also appeared suddenly in the vironment. Thus, the first major problem w defined as the need to develop systems mechanisms to monitor the production of new old chemicals, including knowledge about che cal identity, production volumes, processes tended uses, and by-products. Simple, rapid p sumptive toxicity tests must be designed to e mate their toxicity, with more detailed testing the chemicals which appear to be most hazardo Finally, the meaning for human health of the t icity tests must be understood, and quantitat dosages must be better defined. (See also W 03422) (Kramer-FIRL)
W76-03425

EPIDEMIOLOGY OF WATERBORNE DISEA IN THE UNITED STATES 1971-1973,
Center for Disease Control, Atlanta, Ga. Bur of Epidemiology.
J. M. Hughes, M. H. Merson, and G. F. Craun.
In: The State of America's Drinking Water, S tember 26-27, 1974, Chapel Hill, North Carol Research Triangle Universities, p 38-55. 4 fi tab, 30 ref.

Descriptors: *Public health, *Pollutant identif tion, *Epidemiology, *Water pollution effe *Human diseases, Toxicity, Water supply, W delivery, Shigella, Salmonella.
Identifiers: *Sewage poisoning, *Center for ease Control, *Hepatitis, *Typhoid, Arsenic icity, Waterborne diseases.

Because waterborne diseases in the United St must be recognized and investigated before are officially reported to the Center for Dis Control (CDC) or to the EPA, true incidences difficult to estimate. However, between 1971 1973 the reported number of such outbreaks increased to an average of 24 per year. Waterb outbreak was defined as the occurrence of ill in two or more persons after drinking water w is implicated epidemiologically as the vehicl transmission of the illness. Tables were prov on the types (sewage poisoning, Hepatitis Shigellosis, Giardiasis, Chemical poison Typhoid fever, and Salmonellosis, in orde decreasing frequency) of outbreaks and number of cases for 1971, 1972, and 1973. W systems were classified as municipal, semi-pu and individual. Types of deficiencies foun cause disease in these systems included untre surface water; untreated groundwater; treatm deficiencies; and deficiencies in the distribu system. A large proportion of the outbreaks curred in semi-public systems, particularl summer recreational areas. Case studies for outbreaks were reviewed. These involved: typ in a Florida migrant labor camp; Shigellosis Stockport, Iowa, school; Hepatitis at a school in Alabama; arsenic toxicity in a Minne well; and Shigellosis on a Caribbean cruise To decrease the incidence of waterborne disea is recommended that local, state, and federal a cies establish effective monitoring and m tenance systems for municipal and semi-p systems and that future outbreaks be repo (See also W76-03422) (Kramer-FIRL)
W76-03426

ERIC VIRUSES AND DRINKING WATER PLIES,
h Carolina Univ. at Chapel Hill. Dept. of En- nmental Sciences and Engineering.
. Sobsey.
The State of America's Drinking Water, Sep- er 26-27, 1974, Chapel Hill, North Carolina, arch Triangle Universities, p 56-70. 1 tab, 45

riptors: *Epidemiology, *Viruses, *Potable r, Sewerage, Distribution systems, Water ment, Laboratory tests, Public health, Water tion effects, Analytical tedchniques, Human ses, Water sampling.
ifiers: Hepatitis, Enteric viruses.

little quantitative information is available on ic virus levels in United States drinking r, although it is known that these viruses are nt in sewage and sewage-contaminated natu- aters. Enteric viruses have also been isolated public water supplies in France and South a. Documentation on the epidemiology of rborne transmission of enteric virus disease een limited to outbreaks of hepatitis type A. e outbreaks usually resulted from inadequate ment of private or semi-private supplies or contamination in the distribution systems of c supplies. Because of the inadequate recog- n and reporting of viral disease, it is difficult cognize whether other waterborne disease eaks might have been due to enteric viruses. laboratory and field studies have demon- d that a conventional sewage treatment m with primary and secondary treatment plus ent chlorination will not reduce the enteric concentration by more than about 99%. Vari- ypes of water treatment--chemical coagula- and flocculation, water softening precipita- rapid sand filtration, chlorination, or ozone-- produce a reduction in virus concentration of 7 orders of magnitude. Detection methods been developed which may be used to deter- small amounts of viruses in up to 100-gal nes of drinking water. These methods include through filter adsorption-elution systems and iltration. Enteric virus drinking water stan- have not yet been set, and surveillance stu- are recommended to determine if current bial standards are adequate to protect the c health. (See also W76-03422) (Kramer-)
03427

ANIC CHEMICALS IN DRINKING ER,
rnia State Dept. of Health, Berkeley. Water ation Section.
Spath, and H. J. Ongerth.
he State of America's Drinking Water, Sep- er 26-27, 1974, Chapel Hill, North Carolina, arch Triangle Universities, p 71-79, 14 ref.

riptors: *Recycling, *Water reuse, *Waste sal, *California, *Public health, Water y, Organic compounds, Reclamation, ge disposal, Sewerage, Environmental ef- *Organic wastes, *Chemical wastes.
ifiers: Waste water reuse.

ed reuse of waste waters has increased, par- rly in California where waste water reclama- ncludes crop irrigation, landscape-golf course tion, industrial water supply, recreational im- dments, and groundwater recharge. Califor- ncourages waste water reuse where there is zard presented to the public health. How- much concern has been expressed because e lack of information about the risks of ic illness from long-term exposure to al organics that remain in treated waste . The toxicity of residual organic chemicals een measured in laboratory animals, but ex- lations to humans are difficult and uncertain. to use renovated waste water to augment stic sources as well as proposals for using renovated waste water for industrial purposes are described. Both direct and indirect waste water reuses imply a burden of responsibility. The identity of organic residues in renovated sewage has not been completely established. Further emphasis should be placed on determining organic constituents and identifying health effects, and caution has been urged in future waste water reuse. (See also W76-03422) (Kramer-FIRL)
W76-03428

OVERVIEW OF PROBLEMS ASSOCIATED WITH INORGANIC CONTAMINANTS IN DRINKING WATER,
Environmental Protection Agency, Cincinnati, Ohio.
G. F. Craun, and L. J. McCabe.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 80-98, 3 tab, 37 ref.

Descriptors: *Potable water, *Human disease, *Metals, *Inorganic compounds, Water treatment, Hardness(Water), Water pollution effects.
Identifiers: Water piping, Cardiovascular diseases.

An overview of problems, both acute and chronic, associated with inorganic drinking water contamination is presented. Between 1946 and 1972, 19 outbreaks and 279 cases of waterborne illness were reported due to chemical poisoning. While this represents only 3% of the total waterborne disease outbreaks documented for this period, the mortality rate was 3.4% (compared to 0.05% for all waterborne illness). These poisonings involved fluoride, selenium, arsenic, and copper. Such statistics are useful for implementing prevention measures. However, greater concern has been expressed on the effects of low-levels of contaminants in drinking water on chronic disease mortality. Contradictory results have been obtained from several studies correlating cardiovascular diseases and the mineralization (hardness or softness) of drinking water supplies. Soft water is generally more corrosive and may contain more metal contaminants from water piping; however, hard water contains larger amounts of calcium and magnesium. Extensive research on water quality and cardiovascular disease is on-going. The sources of metals in drinking water have been investigated and distribution sampling for water supplies in Boston and Seattle are illustrated in tabular form. Mutagenic and carcinogenic effects were also postulated, and research on the removal of trace inorganic substances by water treatment processes is being conducted. (See also W76-03422) (Kramer-FIRL)
W76-03429

EVALUATING STATE DRINKING WATER QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
D. H. Taylor, and G. D. Hutchinson.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 99-116. 3 fig, 5 tab, 10 ref, 1 append.

Descriptors: *Water supply, *Public health, *Standards, *Legislation, *Potable water, *Water quality, Sampling, Kentucky, Georgia, Tennessee, Personnel, Water treatment.

The results of studies in four southeastern states on water supply conditions have been summarized. Data were provided for Kentucky, Georgia, Tennessee, and a fourth state whose name has not yet been released. The evaluation included a review of basic water supply statutes, regulations, and program policies. The activities, responsiveness to problems, personnel, and management were examined. The three general types of water supply systems were public water supply, small public water systems (serving non-resident public or fewer than the minimum resident requirement), and primate, single family systems. Public and semi-public water supplies were evaluated for failures to meet bacterial standards, recommended chemical standards, and mandatory chemical standards. Public water supplies were also rated on their failure to fluoridate at correct levels. Other surveillances included bacterial sampling, chemical sampling, cross connection programs, and the existence or lack of annual State Agency inspection. Percentages of supplies having each characteristic were shown in three tables. Overall, water supply practice was found deficient in all four states, in terms of bacterial and chemical standards, treatment and storage facilities, and operator-training. It was suggested that State legislatures need to make greater commitments to the water supply industry to expand margins of safety in water quality and supply. (See also W76-03422) (Kramer-FIRL)
W76-03430

STRATEGIES FOR ASSURING HIGH QUALITY DRINKING WATER IN THE FUTURE,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
D. A. Okun.
In: The State of America's Drinking Water, September 26 and 27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 117-123.

Descriptors: *Potable water, *Water supply, *Regional development, Legislation, Treatment facilities, Construction costs, Water treatment, Personnel, Administration.
Identifiers: Regional Water Authorities System(Great Britain).

Based on findings of several recent surveys, the smaller, private water supply systems in the United States do not have adequate resources in terms of facilities, manpower, or funds to provide high quality service. The United States' problems are of a larger scale than Great Britain; however, recent reorganization in England was cited as a valuable comparison. The new (since April, 1974) Regional Water Authorities System in Britain was described in detail. It was conceded that in the United States, particularly in smaller communities, the quality of waste water treatment facilities operation has not matched investments. In addition, 75% of the construction costs of municipal interceptors and treatment works are met by federal grants, with state governments adding 10 to 15%. Thus, local governments have been reluctant to initiate projects until they are assured grant support. The construction grant program covers only capital costs, thus promoting facilities that maximize construction costs and minimize operating costs, rather than optimizing design. Other problems include the requirement for uniform treatment, disregarding local needs. With the diversity of United States' water supplies, integrated regional management is highly urged. (See also W76-03422) (Kramer-FIRL)
W76-03431

PROBLEMS IN SMALL WATER SYSTEMS,
North Carolina Dept. of Human Resources, Raleigh. Div. of Health Services.
C. E. Rundgren.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 124-134. 2 fig.

Descriptors: *Water supply, *North Carolina, *Costs, Construction, Planning, Engineering, Management, Personnel, Water quality control, Wells, Legislation.
Identifiers: North Carolina Clean Water Bond Act.

Problems of small water supply systems were discussed, with a focus on North Carolina systems. Three types of problems were evaluated: financing, planning, and operation, maintenance,

and management. Financial problems centered around funding of expansion and improvement rather than initial construction. Approaches in North Carolina to solve financing included a Farmers Home Administration program for non-profit water associations. Other alternatives were the sale of a water system to the governmental system or to a privately owned public utility, thus reducing the number of smaller systems. Problems of inadequate planning comprised: improper well site location; inadequate storage capacity; supply capacity source inadequate for demand; distribution pipeline too small; and lack of water quality control provision. Proper development, engineering consultation, and the meeting of 1972 design, construction, and disinfection standards was recommended. Problems of operation, maintenance, and management related to the lack of experience and/or trained personnel, funds for depreciation and expansion, and laboratories for water quality control. While no solutions were available for privately owned water systems, the North Carolina Clean Water Bond Act of 1971 provided funds for municipal water systems. Benefits of partially completed projects under this Act were described. (See also W76-03422) (Kramer-FIRL)
W76-03432

FINANCIAL CONSIDERATIONS FOR RURAL WATER SYSTEMS,
Farmers Home Administration, Washington, D.C.
C. W. Rose.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 135-142.

Descriptors: *Construction costs, *Rural areas, *Water supply, Design criteria, North Dakota, Iowa, Oklahoma, South Dakota.
Identifiers: Water storage, Overdesign.

The Farmers Home Administration (FmHA) has actively been involved in the design and financing of rural water systems for several years. Engineers in the FmHA found it nearly impossible for small isolated communities to meet the rigid standards of urban areas in terms of fire protection, storage capacity, or reserve flows. Successful FmHA systems in North Dakota, Iowa, Oklahoma, and South Dakota were described. These systems recognized potential uses of new construction materials, such as plastic pipes, multimedia filters, and hydropneumatic pressure systems. Because of increasing construction costs, it recommended that rural areas re-evaluate flow calculations and unworkable design guides, with particular emphasis on avoiding unnecessary overdesign. (See also W76-03422) (Kramer-FIRL)
W76-03433

PROBLEMS OF INDIVIDUAL SUPPLIES,
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
W. J. Whitsell, G. D. Hutchinson, and D. H. Taylor.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 143-157. 5 fig, 20 ref.

Descriptors: *Water supply, *Potable water, *Water quality standards, Georgia, Tennessee, Kentucky, Wells, Coliforms, Water pollution sources.
Identifiers: Individual water supplies.

The EPA has estimated that 50 million people in the United States depend upon individual water supply systems. It was also estimated that about 40% of these supplies do not meet safety standards. Studies in Georgia, Tennessee, and Kentucky were conducted; results of coliform tests were illustrated in five graphs. The most common deficiencies, as determined from these studies and other field data were insufficient and substandard well casing, inadequate formation seal between the well casing and bore hole, poor welding of casing joints and indiscriminate perforation of casing, lack of sanitary well covers, reliance on a dug well, and use of well pits to protect from freezing. For safe individual home water supplies, a list of well construction and recommendations was prepared. It included: the construction of wells by drilling, driving, or jetting; use of schedule 40 or heavier steel casing and water-tight welded or threaded-and-coupled joints; installation of solid casing, at least 5 feet below the lowest anticipated static water level; filling of the annular case between the bore hole and casing with a suitable sealant; minimum grouting thickness of the annual space deeper than the deepest frost penetration, sealing out water, of 1 1/2 inches; and proper covering and ventilation. (See also W76-03422) (Kramer-FIRL)
W76-03434

LEGAL CONTROLS FOR PROTECTING UNDERGROUND SOURCES OF DRINKING WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 158-167. 34 ref.

Descriptors: *Legislation, *Groundwater, *Water pollution sources, *Waste disposal, Water supply, Potable water, Land use, Injection wells, Drainage wells, Water quality control.

Proposed legislation, particularly the House of Representatives bill H. R. 13002, emphasizes groundwater as a source of water supply. Passage of this legislation would improve the existing situation by providing federal regulation of state underground injection control programs. However, even adoption of this bill would leave separate policy provisions for gravity flow drainage wells, as opposed to injection wells. Other sources of groundwater contamination, such as surface activities, would remain unregulated under the proposed law. Legal controls currently in effect were reviewed. It was noted that there is no comprehensive program for control of underground sources of drinking water and that basic authority may best be established at the state level. It was also suggested that the scope of necessary controls may have to be expanded to include land use in addition to the restrictions on waste disposal. (See also W76-03422) (Kramer-FIRL)
W76-03435

EMERGENCY SUPPLIES,
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
F. A. Bell, Jr.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 168-177. 1 tab, 7 ref.

Descriptors: *Water shortage, *Water supply, *Earthquakes, California, Water treatment, Distribution systems.
Identifiers: *Emergency water supply, Nicaragua, Urban areas.

Problems of emergency water supplies were examined. Two actual case studies and one hypothetical example resulting from earthquake disasters in urban areas were detailed. No major problems occurred in providing the population of 14,000 with emergency water in San Fernando, California, in February, 1971. In a Managua, Nicaragua earthquake in December, 1972, however, there were 100,000 persons affected. Their program of tank truck water deliveries was effective in sustaining life but was slow and entailed problems of availability and safe water treatment. A hypothetical earthquake of the Hayward Fault (San Francisco Bay, California) would ruin water supply system serving over one million people. Problems would be in distribution, rather than treatment or availability of water. Practical steps were outlined for federal, state, and local governmental preventive measures. These included: assessing available alternative water supplies; taking inventory of possible sources of trucks to carry emergency water; and establishing mutual aid agreements with nearby utilities. (See also W76-03422) (Kramer-FIRL)
W76-03436

AN APPROACH TO PROVISION OF RURAL WATER SUPPLIES,
Conset, Inc., Washington, D.C. National Demonstration Water Project.
S. S. Zimmerman.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina Research Triangle Universities, p 178-189. 1 tab.

Descriptors: *Water supply, *Rural areas, *Sewers, Virginia, West Virginia, South Carolina, Arkansas, New Mexico, Florida, Management, Regional development, Publications.

The National Demonstration Water Project (NDWP) was organized in 1971 and was initially funded by the Office of Economic Opportunity. Its original goal was to bring adequate water facilities to the five rural counties surrounding Roanoke, Virginia. By 1973, the project had grown to include six affiliate projects, from Florida to New Mexico. The basic goals of the NDWP are to build over $30 million worth of facilities by 1976 through the six affiliates; to design and test models for rural water and sewer projects; to gain technical and non-technical expertise for the development of such projects; and to organize a national alliance to continue improving rural water and sewer facilities after the NDWP program is over. Problems of financing, operation, maintenance, and regulation in rural systems were detailed. The present methodology of the NDWP program involves three types of field approaches. The affiliate projects (in West Virginia, Virginia, South Carolina, Arkansas, New Mexico, Florida) are all in low-income rural areas. The Virginia and New Mexico project are non-profit, run by user-owned water-sewer companies. The West Virginia, South Carolina, and Arkansas projects were also developed by non-profit companies, but are managed by public agencies. The Florida project was developed by a cooperative-controlled non-profit agency, and is supported by a rural electric cooperative. On the national level, the NDWP coordinates the various affiliate projects and conducts research for publications on state and federal policies and on rural water sewer development practices. (See also W76-03422) (Kramer-FIRL)
W76-03437

DESIGN OF WATER TREATMENT FACILITIES,
Camp, Dresser and McKee, Inc., Boston, Mass.
P. W. Prendiville.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina Research Triangle Universities, p 190-198.

Descriptors: *Water treatment, *Pilot plants, *Treatment facilities, *Design criteria, Control systems, Automation, Computers, Economics.

A brief overview was presented of currently used methods in the water treatment processes. Topics included: pilot scale investigations; flexibility in design; flocculation and chemical coagulants; sedimentation; filtration; instrumentation and control of the processes; and sludge and waste water treatment and disposal. An emphasis was made on the choice and application of chemicals and the design of the flocculation, sedimentation, and filtration processes. The use of direct filtration

nomic advantages of that method for the treat-
t of some water supplies was also discussed.
use of pilot plants before building treatment
ities was strongly urged, particularly for filtra-
rates, degree of flocculation, and the choice
hemical applications. To allow for future plant
nsion, a recommendation was made that
gn be flexible. Decisions of when to automate
r treatment facilities were considered, par-
arly for the filtration process, chemical
esses, and hydraulic flow-through. In larger
ts, the logging of data, control loops, and
tenance programs may also be computerized.
considering the waste treatment plant, the
osal of solids was seen as a major design
lem. (See also W76-03422) (Kramer-FIRL)
-03438

TER RATES: AN ASSESSMENT OF CUR-
T ISSUES,
s Hopkins Univ., Baltimore, Md.
. Hanke.
The State of America's Drinking Water, Sep-
er 26-27, 1974, Chapel Hill, North Carolina,
arch Triangle Universities, p 199-218. 2 fig, 18

riptors: *Costs, *Water demand, *Water
, Economics, Computers, Model studies,
inal costs, Water supply, Environmental ef-
, Water consumption, Cost allocation.

-making policies for water utilities in the
n United States were assessed. Changes have
loped, from flat rates to metered rates, with a
ning block structure (the first blocks of water
umed during a billing period are purchased at
en rate, with successive larger blocks costing
This declining block structure is being
ually eliminated and utilities are considering a
ge to a seasonal rate structure system,
eby rates would be higher in seasons of high
high use. The theory of marginal cost pricing
lescribed. It was argued that there are several
cts in the actual design of pricing policies, and
historical average costs that are used are not
inal or incremental. Rate-making policies
also criticized for using variable costs not
lated with the demand for either capacity or
r. Important new trends in rate-making in-
d computer simulation models to evaluate
structures and their impact on water use,
r flows, costs, revenues, and required invest-
. New changes in rate structures were at-
ed to a compromise between industry and
omists' views as well as to environmental
ation. (See also W76-03422) (Kramer-FIRL)
03439

NING OPPORTUNITIES AND THE SAFE
KING WATER ACT,
nsboro Public Works, N.C.
Shaw, Jr.
he State of America's Drinking Water, Sep-
er 26-27, 1974, Chapel Hill, North Carolina,
rch Triangle Universities, p 219-223.

riptors: *Personnel, *Training, *Professional
nnel, *Water rates, Water treatment, Water
ion control, Publications.
ifiers: Public relations, Emergency water
ng.

arious developments in the training of opera-
chemists, clerical personnel, maintenance
nnel, utility engineers, and managers in the
treatment profession were described. The
ican Water Works Association (AWWA)
ation Program, which has been on-going for
ars, has been very successful. One AWWA
e in Emergency Planning for water utility
gement included disaster effects, vulnerabili-
essment, protection measures, and emergen-
erations planning. Another AWWA seminar
cident prevention has incorporated OSHA
ements and methods to set up an effective program within the utility. One-day seminars have been held since 1973, including the topics of: developing water rates; OSHA compliance and accident prevention; upgrading existing water treatment plants; enhancement and control of reservoir water; and public information/public relations. A project was funded by HEW for the Oklahoma Research Foundation to obtain data in order to provide model job descriptions, performance standards, work-load indicators, and staffing guides. Other developments include the revision of the Water Supply Visual Aids Index and the compilation of the Water Utility Training Directory. AWWA training manuals and materials have increased in circulation and a section of these publications are being translated and printed for distribution in foreign countries, beginning with a program in Brazil. (See also W76-03422) (Kramer-FIRL)
W76-03440

MATHEMATICAL OPTIMIZATION OF WATER SUPPLY SYSTEMS STATE OF THE ART,
Michigan Univ., Ann Arbor. School of Public Health.
R. A. Deininger.
In: The State of America's Drinking Water. September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 224-234. 100 ref.

Descriptors: *Reviews, *Model studies, *Computer models, Mathematical models, Linear programming, Simulation analysis, Water supply, Systems analysis, Treatment facilities, Water treatment, Decision making, Bibliographies, Optimization.

A state-of-the-art review is presented on the tools and techniques available to the systems analyst for solving water supply problems. An extensive bibliography is presented, divided into: general water supply network references; design of well fields; water distribution systems; and models of treatment plants (staging). By using mathematical models and optimization techniques, such as linear programming, more alternatives may be analyzed at each level of decision making, and assumptions or estimations of the influence of economic, political, and environmental uncertainties may be tested. Such techniques also provide a communications tool for professionals involved in water supply planning. The basic steps of a system analysis are outlined. Types of techniques used are: linear programming; nonlinear programming; dynamic programming; integer programming; stochastic programming; geometric programming; network techniques PERT/CPM; simulation techniques; and classical optimization techniques. Although any one of these mathematical modeling and computational techniques increases the capability of generating information to be used in the decision-making process, it was emphasized that these are only tools, and cannot by themselves solve water supply systems problems. Additionally, one must be careful in applying model solutions to real situations. (See also W76-03422) (Kramer-FIRL)
W76-03441

WATER DEMAND FORECASTING--SOME CONCEPTS AND TECHNIQUES,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. T. Lauria.
In: The State of America's Drinking Water, September 26-27, 1974, Chapel Hill, North Carolina, Research Triangle Universities, p 235-258, 8 fig, 20 ref.

Descriptors: *Forecasting, *Water demand, *Model studies, Mathematical models, Economics, Potable water, Water supply.

Three categories may be used to forecast water demand: locational classification; consumptive use; or usage classification (purpose for which the water is demanded). The third of these is the most commonly used basis for forecasting. Such purposes include irrigation, cooling, commercial supply, residential supply, street washing, and fire protection. The classic economic theory of demand was presented. This theory identifies the basic variables underlying demand, including social tastes and preferences. Most predictions, however, are based on future requirements or needs rather than demand. Three methods used--time series models, regression models, and input/output models--were outlined. It was concluded that the combination of economic theory and mathematical modeling will help investigators to understand and quantify fairly accurately the water demand phenomenon. However, most theory deals with static situations, and more time series analyses and projections of trends are necessary for future estimates. (See also W76-03422) (Kramer-FIRL)
W76-03442

ACTIVATED CARBON: OLD SOLUTION TO OLD PROBLEM, PART II,
A. D. Adams.
Water and Sewage Works, Vol 122, No 9, p 78-80, September, 1975. 4 fig, 1 tab, 24 ref.

Descriptors: *Activated carbon, *Adsorption, *Water treatment, Anaerobic conditions, Sedimentation, Sludge treatment, Dewatering, Operating costs, Anaerobic digestion, *Waste water treatment.

The use of lignite powdered activated carbons in anaerobic digesters, due to the carbons' properties of density and activity, is proposed. Carbon aids in settling supernatant solids so that fewer fine, poor-settling solids are returned to the hydraulic processing section of the plant. Powdered carbon also adsorbs grease and scum that might clog digesters and interfere with mixing. By adsorption, carbon also removes detergents which could interfere with dewaterability of the digested sludge. While the addition of carbon initially increases operating costs, it settles biological solids, clears supernatants, removes odors, and thickens sludge. Digesters containing activated carbon are less susceptible to upsets than conventional systems, and adsorb inhibitory substances that could be toxic to the anaerobic bacteria. Costs over time are reduced because there is less need for dewatering chemicals, deodorant chemicals, chlorine, and supplementary fuel oil. A graphic representation is provided of the time required for an anaerobic system to respond to activated carbon addition. Within two months, supernatants should clear, as carbon becomes incorporated in the biofloc. By four months, gas production should increase and sludge solids should decline. Within six to eight months, the daily carbon dose will be reduced because less sludge is being withdrawn from the digester and operating costs will be lowered accordingly. (Kramer-FIRL)
W76-03443

5G. Water Quality Control

FORAMINOUS COMPOSITION FOR REMOVAL OF OLEOPHILIC MATERIAL FROM THE SURFACE OF WATER,
Sorbent Sciences Corp., Covina, Calif. (Assignee).
J. Orban, and C. E. Case.
U S Patent No 3,917,528, 6 p, 3 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 940, No 1, p 381, November 4, 1975.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Sorption, *Absorption, *Separation techniques.
Identifiers: Drying oil.

A foraminous substrate which is impregnated with a drying oil is used to rapidly sorb oleophilic or

crude oil from a body of water. To prepare the foraminous substrate, it is suspended in a bath containing a drying oil for at least 0.5 minutes. Then it is removed and excess drying oil is removed by passing the material between mechanical rollers. The foraminous substrate treated with drying oil sorbs substantially more crude oil than other compositions that do not contain the drying oil. Examples of the drying oils are: caster oil, grape seed oil, hemp oil, linseed oil, safflower oil, etc. It is believed the drying oil coats the walls of the cells of the foraminous material to form a continuous hydrophobic-oleophilic barrier which prevents water from being sorbed. (Sinha-OEIS)
W76-03012

HARVESTING AS A CONTROL FOR AQUATIC PLANTS,
Wisconsin Univ. Extension, Madison.
S. Nichols, and G. Cottam.
Water Resources Bulletin, American Water Resources Association, Vol 8, No 6, p 1205-1210, December 1972. 1 fig, 4 tab, 5 ref. OWRT B-019-W15(5).

Descriptors: *Aquatic plants, *Harvesting of algae, Effects, *Lakes, Eutrophication, Control, Management, Aquatic environment, Biomass.
Identifiers: Lake Mendota(Wis), Macrophytes.

An excellent example of lakes that suffer from increased eutrophication as a result of their location in a heavily populated and fertilized urban and agricultural area is that of the lakes in the Madison, Wisconsin area. The accelerated plant growth, along with the invasion of the Eurasian water milfoil, has created problems by greatly restricting the use of these lakes, which are under varied and increasing recreational pressures. Such situations necessitate effective control and management procedures. This paper presents the results of a study of the effects of harvesting on hydrophytes in Lake Mendota, Wisconsin. Results show that one harvest reduced growth by at least 50%, two harvests reduced it by 75%, and three harvests virtually eliminated plant material for the year. The studies also indicate that harvesting one year reduced the biomass the following year, especially in deep water. Three harvests during the previous year were most effective in controlling biomass the second year. To conclude, harvesting does control aquatic plants; the types of control provided can be used in a selective management program that will be beneficial to a wide variety of users. (Bell-Cornell)
W76-03058

ECOLOGY, ECONOMY AND MINING IN VERMONT,
D. Tillman.
Pit and Quarry, Vol 66, No 8, p 66-68, February, 1974. 4 fig.

Descriptors: *Water pollution control, Waste water treatment, *Industrial wastes, *Mining, *Vermont, Lagoons, Environmental effects, Environmental engineering.

Harmonious coexistence of environmental and industrial concerns are demonstrated by the state of Vermont. Mining is a highly significant industry in the state; asbestos production ranks second, and talc extraction and processing ranks third in the nation. Ground calcite, coarser limestone, sand, and gravel are also important economically. At the same time, the state of Vermont is a pioneer in environmental legislation and protection. The mutual cooperation and concern which led to this desirable status is demonstrated by Windsor Minerals, one of the nation's top ten producers of talc products. Windsor operates four mines and two processing plants. Elimination of water pollution at its major processing plant was achieved by pumping water into a series of lagoons, and decanting inert impurities. Eighty percent of the water is recovered. Tailings ponds, when filled, are revegetated. Another illustrative case is the White Pigment Corporation which operates calcite grinding plants. Aesthetic considerations are also important to much of the mining industry. The head frame and ore bin of Windsor Minerals' largest mine has the appearance of a New England barn, while the office structure of the processing plant is designed as a colonial house set on a hill with natural plantings. Tree screens and plantings characterize the entire operation and minimize visual effects of loading areas and machinery. Nearly 10% of the total plant investment for Vermont's mineral community goes towards environmental protection. (Murphy-FIRL)
W76-03061

A LABORATORY INVESTIGATION OF THE EFFECT OF SURFACE FILMS ON WIND INDUCED REAERATION,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W76-03100

A NUMERICAL MODEL OF DROPLET ENTRAINMENT FROM A CONTAINED OIL SLICK,
Mount Auburn Research Associates, Inc., Newton Upper Falls, Mass.
For primary bibliographic entry see Field 5B.
W76-03102

ATMOSPHERIC REAERATION IN A RIVER USING PRODUCTIVITY ANALYSIS,
Virginia Univ., Charlottesville.
G. M. Hornberger, and M. G. Kelly.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 101, No EE5, Proceedings Paper 11644, p 729-738, October 1975. 2 fig, 1 tab, 17 ref, 2 append.

Descriptors: *Reaeration, *Air-water interfaces, *Aeration, *Productivity, *Dissolved oxygen, *Environmental engineering, *Virginia, Respiration, Streams, Rivers, On-site investigation.
Identifiers: *Mechums River(Va), *Parameters.

Two new methods for estimating the reaeration coefficient in rivers were developed. The methods use measurements of dissolved oxygen and incident radiation with a solution to the oxygen mass balance equation. Parameters are estimated by minimizing the squared error between predicted and observed oxygen values. Night-time values of dissolved oxygen can be used to estimate the reaeration coefficient provided respiration is nearly constant. The coefficient can also be estimated by comparing net productivity with incident radiation. Field studies showed the two methods to be reliable. (Lardner-ISWS)
W76-03115

SPARTINA REVEGETATION ON DREDGE SPOIL IN SE MARSHES,
Skidaway Inst. of Oceanography, Savannah, Ga.
W. M. Dunstan, G. L. McIntire, and H. L. Windom.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 101, No WW3, Proceedings Paper 11530, p 269-276, August 1975. 5 fig, 1 tab, 16 ref, 1 append.

Descriptors: *Aquatic plants, *Marshes, *Revegetation, *North Carolina, *Georgia, Coastal engineering, Dredging, Environmental effects, Environmental engineering, Reclamation, Spoil banks, Harbors, Marsh plants, Vegetation establishment, Tidal marshes, Salt marshes, Southeast U.S.
Identifiers: Coastal salt marshes, Dredge spoils, Hydraulic excavation, Transplantation, Spartina alterniflora, Marsh regeneration, Silt-clay spoil site.

Spoil from the dredging of harbors, rivers, and the Inland Waterway when deposited on salt marshes often permanently destroyed these important natural resources. Portions of destroyed marsh could be restored through transplantation of the major marsh plant spartina alterniflora. This was accomplished in a typical silt-clay spoil site along the Intra-coastal Waterway in Georgia for less than $100 per acre. Thirty percent of the transplants survived and were continuing to spread 1 months after planting. Elevation of the soil was of prime importance for transplants; at lower elevations survival rates were as high as 75%. The use of seeds and nursery grown seedlings was not successful; only 13% of the seeds germinated and none of the seedlings survived. The success of the transplantation experiment on the silt-clay dredge spoil of Georgia attested to the real potential of rebuilding destroyed marshes all along the southeast United States coast. It was noteworthy that the technical and unskilled workers involved had no prior experience with such projects and that the cost was about $0.025 per square meter. (Roberts-ISWS)
W76-03121

UNCONVENTIONAL NUCLEAR POWER PLANT SITING OPTIONS AND WATER RESOURCE IMPACTS,
Connecticut Univ., Storrs. Inst. of Water Resources.
C. D. Stern.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 44 $3.50 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report, December 1975, 8 p. OWRT A-056-CONN(1). 14-31-0001-5007.

Descriptors: *Nuclear powerplants, *Cooling towers, *Underground powerplant, *Environmental effects, Cooling water, Water pollution sources, Thermal pollution, Sites.
Identifiers: *Electric generating stations, Sea water cooling towers, Floating nuclear plant, *Technology assessment, Powerplant siting.

A technology assessment of three unconventional power plant siting options: floating nuclear plants, plants utilizing salt-water cooling towers, and underground nuclear plants was undertaken. Floating nuclear plants have some environmental benefits less land-use and reduced thermal impact on the marine environment. Salt-water cooling towers offer more flexibility in power-plant siting, but emit salt to the atmosphere which in areas of low ambient salt concentrations could cause damage to certain agricultural crops and in some regions micro-meteorological problems. Underground nuclear plants do not appear to offer sufficient advantage to offset the added construction cost and it is unlikely that they will be permitted to be built any closer to population centers than conventional nuclear plants. (de Lara-Connecticut)
W76-03135

CONTROL OF NITROGEN TRANSFORMATIONS IN SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-03141

HEAT ASSIMILATIVE CAPACITY OF SANGAMON RIVER,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5B.
W76-03142

DYNAMIC WATER QUALITY MANAGEMENT STRATEGIES,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. P. Lettenmaier, and S. J. Burges.

nal Water Pollution Control Federation, Vol No 12, p 2809-2819, December 1975. 1 fig, 1 14 ref.

criptors: *Water quality control, nagement, *Design, *Streams, Constraints, itoring, Probability, Control, Rivers, ch(Streams), Mathematical models, Systems ysis, Simulation analysis, *Permits, Water its.
tifiers: *Multiple objectives, Modeling per-, System dynamics, Control loop, Time scale.

complexity of the water quality management lem is greatly increased by the transient na- of the goals and multiple objectives of the agement system. Consequently, considerable bility must be built into a management system n. The design problem may be aided by view- he system as a control loop. Management irements are conveniently summarized in a agement time scale. Described are three broad es of stream water quality management that ct the degrees of technical and management istication required for permits written to ac- odate uncertainty in stream water quality mics, uncertainty in management goals, and traints imposed on the managing agency. elines for choosing one of the three possible es of management are presented and depend ne management time scale and model level fied. It is important to examine what con- es the total management system proposed. specific components investigated include the ical system dynamics, management system mics, and measures of the state of the physi- ystem. The possibility of a combined strategy onitoring and modeling is considered in view e uncertainty associated with estimates of ty vectors. The use of a permit system allows flexibility necessary to handle multiple ient objectives. In general, shorter manage- time scales imply more sophisticated gement systems. (Bell-Cornell)
03158

INISTRATION: SYSTEMS ANALYSIS, ERATURE REVIEW),
ell Univ., Ithaca, N. Y. School of Civil and onmental Engineering.
rimary bibliographic entry see Field 6A.
03159

ELS OF LAND AND WATER ALLOCA- TO IMPROVE ENVIRONMENT AND ER QUALITY THROUGH SOIL LOSS TROLS,
State Univ., Ames. Center for Agricultural Rural Development; and Iowa State Univ., . Dept. of Economics.
Heady, and K. J. Nicol.
Resources Research, Vol 11, No 6, p 795- December 1975. 4 fig, 5 tab, 4 equ, 3 ref.

iptors: *Water quality control, ronment, *Water allocation(Policy), Land rces, Agriculture, United States, Water , Crops, Livestock, Technology, Evalua- Economic impact, Optimization, Con- ts, Equations, Mathematical models, ms analysis.
fiers: Land allocation, Soil loss controls, inimization.

l loss, land-water allocation optimization has been developed that is applicable to all ltural land in the United States. The model es 223 producing areas, 1891 land resource and 51 water supply regions. Different ng systems and technologies are defined for rop and livestock system in each of the 1891 esource regions. The programming model is f very large scale, including also a transpor- submodel and market regions. As a means er quality improvement, limits are placed in r acre per year soil loss as a means of reduc- ing sedimentation and the transport of nitrogen and phosphates into streams. A nitrogen balance equation limits fertilizer purchases and forces utilization of livestock wastes in the region. The model forces a land use system and set of technologies over the country and interregionally having soil loss unrestricted, at 10 tons per acre, at 5 tons per acre, and at 3 tons per acre. The unrestricted and 5-ton limits are reviewed in this paper in relation to impacts on soil loss (reduced about 25%), crop distribution, technology, water use, and farm prices. (Bell-Cornell)
W76-03164

WATER QUALITY PERCEPTION BY USERS: CAN IT SUPPLEMENT OBJECTIVE WATER QUALITY MEASURES,
Great Lakes Forestry Research Center, Sault Sainte Marie (Ontario).
J. A. Nicolson, and A. C. Mace, Jr.
Water Resources Bulletin, Vol 11, No 6, p 1197-1207, December 1975. 8 tab, 9 ref.

Descriptors: *Water resources, *Recreation, *Water pollution, *Measurement, Parks, Water sampling, Lakes, Evaluation, Management, *Minnesota, Water quality control, Attitudes, Social values.
Identifiers: Perception, Interviews.

Personal interviews were conducted with eighty campers in each of three Minnesota state parks to investigate the water quality perception of the recreationist. Simultaneously, water quality factors were measured or observed as an indication of conditions experienced by the interviewees. Most respondents perceived water pollution strictly on a visual basis, with sewage, public carelessness, industry, and farm fertilizers seen as major causes of water pollution. Seventy percent felt their recreational activities did not contribute to water pollution. Sixty-two percent said their life had not been affected by water pollution, while over two-thirds of the remaining thirty-eight percent listed curtailment of recreation as the primary result. Many mentioned an algal bloom at one park and the strong odor of rotten fish at a second park. It has been concluded that these were the only major problems in the three parks. Some incipient problems, such as nutrient enrichment and the presence of coliform bacteria, were indicated by the measurements. The type and degree of pollution identified by the recreationist could be important through its influence on user evaluations and space preferences. The establishment of relationships between water quality parameters and the perception of the recreationist will provide the manager with a tool to assist in evaluating participation in water-related outdoor recreation in terms of both user satisfaction and water quality. (Bell-Cornell)
W76-03168

LATEX PAINT WASTES--MUNICIPAL CHARGES AND TREATMENT,
East Bay Municipal Utility District, Oakland, Calif.
For primary bibliographic entry see Field 5D.
W76-03199

A NOTE ON OPTIMAL TAXATION OF ENVIRONMENTAL SPILLOVERS,
Cornell Univ., Ithaca, N.Y.
P. Pestieau.
Journal of Environmental Economics and Management, Vol 2, No 1, p 34-39, September, 1975. 7 ref.

Descriptors: *Pollution charges(Taxes), *Model studies, *Tax rates, *Industrial wastes, *Economics, Waste water treatment, Treatment facilities, Water pollution control, Pollution abatement.
Identifiers: Effluent taxes, Economic models.

An economic model was formulated to determine the environmental policy for the situation where industrial pollution can be reduced partially by effluent taxation and partially by a publically owned waste treatment plant. The setting for the policy decision was a competitive economy with constant returns to scale technology and commodity taxation. In the case of increasing returns to public abatement, an effluent tax set at marginal user cost does not generate enough revenue to finance the facility. Thus, the problem lies in finding additional revenue most efficiently. This problem is discussed in the framework of commodity taxation. The cost of pollution control is shifted to the consumers, and taxes derived on efficiency grounds might prove to have a regressive incidence which can be avoided only by considering social welfare functions. (Kramer-FIRL)
W76-03202

EFFICIENCY OF POLLUTION TAXATION AND MARKET STRUCTURE,
Colorado Univ., Boulder.
D. R. Lee.
Journal of Environmental Economics and Management, Vol 2, No 1, p 69-72, September, 1975. 5 ref.

Descriptors: *Pollution charges(Taxes), *Water pollution control, *Tax rates, Pollution abatement, Costs, Industrial wastes, Economics.
Identifiers: Market structure.

The performance of a uniform pollution tax in achieving a given level of pollution at least cost is examined. A lack of attention has been given to market organization in discussing externalities and pollution control. It was demonstrated that unless all polluting firms have the same elasticity of demand at their equilibriums, imposing the same per-unit pollution tax on each firm will not result in a minimum cost reduction in pollution. The same pollution reduction could be achieved at a lower cost with increased reduction by firms with high demand elasticity and less reduction by firms with low demand elasticity. In general, least-cost abatement will not result from a pollution tax uniformly applied. The situation where differing degrees of market power exist among polluters and the possible patterns of pollution taxes to achieve least-cost abatement are discussed. (Kramer-FIRL)
W76-03204

OPTIMAL POLLUTION CONTROL WITH A NONCONSTANT EXPONENTIAL RATE OF DECAY,
Guelph Univ., (Ontario). Dept. of Economics.
B. A. Forster.
Journal of Environmental Economics and Management, Vol 2, No 1, p 1-6, September, 1975. 3 fig, 10 ref.

Descriptors: *Water pollution control, Hydrologic aspects, *Lakes, *Mathematical models, Economics, Model studies, Planning, Water management(Applied), Water resources development, Optimization.

While most recent pollution control studies have assumed a constant exponential decay rate, this paper examines the effects of introducing a non-constant exponential decay rate into a pollution control model. The question posed to the economist was whether it is ever optimal to let a waterway such as Lake Erie die. If the pollution level becomes great enough, a waterway may be unable to cleanse itself. A model was formulated, allowing for the fact that pollution may depress the rate of selfpurification of a body of water. A previously defined decay function was used to outline a descriptive theory of pollution and capital accumulation. The analysis suggested that the choice of cleaning up overly polluted lakes is dependent upon the social welfare objectives and priorities of the particular society. (Kramer-FIRL)
W76-03206

ENERGY DISSIPATOR AIDS FIGHT AGAINST HIGH PRESSURE PROBLEMS.
For primary bibliographic entry see Field 4B.
W76-03212

PRIVATE CONSTRAINTS ON GROUNDWATER CONTAMINATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W76-03244

CAN WE AFFORD ZERO POLLUTION RISK,
Texas Univ. at Austin. Dept. of Civil Engineering.
J. O. Ledbetter.
Water and Sewage Works, Vol 122, No 9, p 104-105, September, 1975. 5 ref.

Descriptors: *Pollution abatement, *Statistics, Toxicity, Public health, Epidemiology, Water pollution, Air pollution, Standards, Pollutants, Waste assimilative capacity.
Identifiers: Zero discharge.

The goal of zero pollution has been developed by an advertising campaign by Federal environmental agencies and the zero defects concept from the space program. The pollution regulatory agencies use the health effects of pollutants as the reason for pollution control and use the advertising campaign to build their empires through increased budget appropriations from a frightened congress. Toxicologists believe that small doses of toxic materials will stimulate while epidemiologists maintain that even a small exposure to a large population for a long period of time can cause disease. The epidemiologist arrives at this conclusion through the use and misuse of statistics. Life scientists are overawed by statistics and assume spurious and specious correlations and then use these correlation to prove cause-effect relationships. Spurious and specious correlations will continue to be promoted as long as publicity or appropriations of money for studying the pollutant are to be gained. However, there is a chance that many actions taken to prevent some real or imagined ill will cause more damage than the status quo. Pollution control should be free of ambivalence, and a single air quality standard for the entire country should not be adopted. The environment can safely assimilate at least small amount of pollutants. The proper level of pollution control will ensure a balance of sociological desireability, technological capability, economical feasibility, and environment assimiliability. (Orr-FIRL)
W76-03249

HYGIENIC ASSESSMENT OF THE FLOTATION REAGENT T-66 IN THE WATER BODIES AND ITS MAXIMUM PERMISSIBLE CONCENTRATION (GIGIENICHESKAYA OTSENKA FLOTOREAGENTA T-66 V VODE VODOEMOV I EGO PREDEL'NO DOPUSTIMAYA KONTSENTRATSIYA),
For primary bibliographic entry see Field 5C.
W76-03255

RESEARCH NEEDS FOR WATER RESOURCES CONTROL IN CALIFORNIA.
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
Publication No 48, April 1973. 55 p.

Descriptors: *Water quality control, *California, *Research and development, Methodology, Water rights, Groundwater, Water pollution control, Water pollution effects, Toxins, Nutrients, Disinfection, Recycling, Waste treatment, Sludge disposal, Water reuse, Erosion, Silting, Eutrophication, Encroachment, Salinity, Oil spills, Mine wastes, Monitoring, Waste disposal, Legal aspects, Economics, Institutional constrains, Irrigation water, Heavy metals, Geologic formations.

The California State Water Resources Control Board defines water quality control related problems, outlines research needs to solve these problems and presents policy guidelines for establishing priorities, funding and evaluating proposals. In its research program the Board assigns highest priority to the development of methodology and data for the State Board and the nine regional water quality control boards. Three classes of research priorities are established. Research areas included in Priority I are methodology and data for analysis of water rights applications, impact of wastes on groundwater, and influence of toxicants and biostimulants on surface water; reliable disinfection systems; recycling and use of wastewater solids and reclaimed wastewater; and control of pollution from irrigated agriculture. Control of water quality are surveyed in such areas as erosion and siltation, degradation of groundwaters, increasing salinity of surface water, eutrophication, toxicity, oil and other hazardous material spills, mine wastes and geochemical hazards. Procedures and problems in water quality monitoring, wastewater treatment residue processing and disposal, reclamation and reuse are described. Perhaps the most difficult problems to resolve are those in the legal, economic and institutional fields. (Carpenter-Wisconsin)
W76-03265

RESIDUAL CHARGES AND PROFITS,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
R. J. Anderson, and T. A. Ferrar.
Working Paper No 1, November 1973. 9 p, 6 ref.

Descriptors: *Pollution abatement, *Pollution taxes(Charges), Industries, Investment, Costs, Motivation, Compensation, Profit.
Identifiers: Subsidies.

A common contention is that residual charges for pollution control will profits for firms. Such a viewpoint is, naturally enough, often espoused by industry representatives. Economists do not generally favor such a position based on the assumption that if charges are levied firms will very quickly find an efficient way to remove the pollutants and continue to run their operation efficiently. This study examines the problem of finding a residual charge that will not adversely affect profits. The key concept is that firms will be motivated to reduce pollution by the marginal rather than the total tax imposed. A tax proposed by the President in 1973 is examined and found to involve a heavy tax burden. A modification is suggested that contains an incentive and this substantially reduces the tax liability. Some discusstion examines briefly the principles for setting appropriate tax levels for pollution control. The more ways a policy can be interpreted the greater is its opportunity for successful adoption. (Carpenter-Wisconsin)
W76-03267

EFFLUENT CHARGES, ENVIRONMENTAL QUALITY AND OTHER NATIONAL GOALS: A QUALIFICATION,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
G. Neumann, and T. Ferrar.
Working Paper No 7, (1974). 8 p, 6 ref.

Descriptors: *Pollution taxes(Charges), *Economic impact, *Employment, Industrial production, Byproducts, Equations, Theoretical analysis.

The theory that the impact of pollution taxes will affect the economic national goals by reducing industrial production is examined by utilizing equations for a firm that has both input and output substitution possibilities. That is, the employment of inputs such as raw materials, labor, and equipment results in the production of the intended final product, one or more byproducts, and one or more waste products. The economic literature has ignored the production of byproducts and very little attention has been given to the decisions which implicitly generate their production. The essential point is made that except in the case in which waste products and/or byproducts are joint products, in the sense that a given amount of each is necessarily produced for each unit of primary output, the firm must make an economic decision of how much of each to produce. It is contended that while effects of reduction in production output would possibly be realized from the implementation of a waste tax policy, it also highlights the production characteristics which must be examined in order to conclude that output and employment will be impacted. Specifically, the existence of technological parameters must be empirically examined before conclusive statements can be made concerning the effect of waste charges on employment. (Auen-Wisconsin)
W76-03268

A SOCIOLOGICAL ASSESSMENT O ECONOMIC INCENTIVES FOR INDUSTRIA POLLUTION ABATEMENT,
Pennsylvania State Univ., University Park. Cente for the Study of Environmental Policy.
E. R. Hammer.
Working Paper No 9, (1974). 21 p, 24 ref.

Descriptors: *Pollution abatement, *Industrie *Motivation, *Pollution taxes(Charges), Regul tion, Government finance, Penalties(Legal), Jud cial decisions, Standards, Employment, Behavio Political aspects, Geographical regions.
Identifiers: *Resource charge, Abatement su sidy.

'Judicial action' is the major policy currently e ployed by the government in indus'rial polluti abatement. This policy emphasizes courtroom tivity and accompanying legal regulation, where legislation is enforced by 'public agencies'. T discussion revolves on the inability of this syst to address the necessity for 'economic incentive and analyses two other policies for industrial p lution abatement--the 'resource charge' and 'abatement subsidy'. The 'resource charge' poli is strongly supported by economists who approa pollution abatement from a non-crisis positi Through this approach the gap between priv (production) and social (pollution) abatement co would be closed as the pollution-penalty syst became an integral part of the firm's product system. 'Abatement subsidy', on the other ha utilizes the principle of positive incentives. economic theory alone the resource charge al native appears the most applicable. Howev when assessing abatement from a crisis persp tive, such non-economic factors as time, polit manipulation, and public support become imp tant. The conclusion is that a subsidy prog (based on positive reinforcement) may be a m efficient policy for bringing about a short-run lution abatement under crisis conditi (Carpenter-Wisconsin)
W76-03269

FINANCIAL INCENTIVES AND POLLUTI CONTROL. A CASE STUDY,
Pennsylvania State Univ., University Park. Ce for the Study of Environmental Policy.
T. A. Ferrar, A. B. Brownstein, J. P. Simpson, S. Streiter.
Report No 16, December 1974. 55 p, 7 ref. EPA 01-2250.

Descriptors: *Air pollution, *Standards, *F *Oil, *Regulation, *Assessments, Pollution a ment, Decision making, Sulfur, Pricing, Adm tration, Northeast US, New York.
Identifiers: *Variant pollution stand *Surcharges, Fuel oil, New York(Boston(Mass).

nergy crisis has produced considerable
ır that air pollution control restrictions be
d to allow utilization of available energy
s. Environmentalists consider the relaxation
quality standards, as a retrograde step.
mists see groups seeking relaxation of regu-
as having financial incentives to push such
sion, if granted, to the limit. Public officials
he task, given these circumstances, of
the merit of applications for relaxing the
on regulations, against their obligation to
that air quality improvement progress is
ined. Shortages of low-sulfur residual fuel
he Northeast U.S. in 1972-73 and 1973-74
air quality standards had to be relaxed by al-
higher sulfur-content in fuel oil. This ex-
e provides the basis for this study, which
er, is qualitative and descriptive rather than
ative as those interviewed were reluctant to
confidential information given the market
licy uncertainties. A desirable policy on
e of standards combines a uniform vari-
tructure and a fuel-oil surcharge. The
ge should more than compensate for the
nd/or profit) differential involved in using
onforming and noncomforming fuels to en-
e use of environmentally acceptable fuels
possible. The alternative policy tool of
n taxes is also reviewed. (Carpenter-
sin)
270

ONMENT LAWS MAY CLOSE MANY SH FACTORIES.
News International, Vol 6, No 13, p 28-33,

tors: *Water quality standards, *Water
n control, *Fish handling facilities,
mic impact, *Canneries, Industrial produc-
ommercial fish, Marine fish, Shellfish,
Safety factors, Economies of scale, Prices,
, Clams, Bottom fish, Salmon.
ers: *Seafood processing industry.

ws of the National Marine Fisheries Ser-
arding the national effluent guidelines for
processors are given. Costs of these
nents are almost prohibitive, will increase
er costs, and divert funds from expansion
Environmental spending would boost the
inflation rate 0.3-0.5%. The industry has
mall plants--42% have sales less than
), consequently the suggested pollution
nt methods would equal or exceed their
ales figures. Only 17% have sales exceed-
illion. The proposed guidelines will affect
the processors. Total capital investment
uld be $375 million, yearly operating and
ance costs $3.5-10 million, and monitoring
million a year. Price effects caused by pol-
ntrols are the most critical factor in deter-
he economic impact. These will depend on
t, the area, and cost of foreign products.
ironmental Protection Agency assumption
price effects will approximately equal the
abatement costs incurred by the largest
r is correct for the large processor, but
ocessors cannot compete. The smallest
re exempt, but middel-sized plants will
not be able to withstand the cost. The
clam, bottomfish, and salmon industries
ardest hit. (Buchanan-Davidson--Wiscon-

73

EPENDENCE OF AIR, WATER, AND LLUTION CONTROL STRATEGIES IN R PLANT AND A KRAFT MILL,
Columbus Labs., Ohio.
ary bibliographic entry see Field 5D.
97

BIBLIOGRAPHY OF WATER POLLUTION CONTROL BENEFITS AND COSTS,
Development Planning and Research Associates, Inc., Manhattan, Kans.
S. G. Unger, and D. L. Jordening.
Available from the National Technical Information Service, Springfield, Va 22161 as PB239-424, Price $7.50 in paper copy, $2.25 in microfiche. Report No. EPA-600/5-74-028, October 1974. 187 p. 1B1030/ROAP 20aab-02. EPA 68-01-6237.

Descriptors: *Bibliographies, *Water pollution control, *Benefits, *Costs, Cost-benefit analysis, Water quality standards, Water resources development, Environment, Economics, Waste disposal, Pollutants, Water treatment, Sewage treatment, Water distribution(Applied), Facilities, Air pollution.

This bibliography of water pollution control benefits and costs contains 3000 references alphabetized by author. It was part of a project to extrapolate regional estimates of water quality enhancement programs for a preliminary estimate of national water pollution control benefits and costs. The primary selection criteria was that the citation pertained to water pollution control benefits and costs. However more general environmental issues with water quality problems are included. Much of the economic cost-benefit analysis research was conceptually developed and/or applied in resource-use areas other than water; however the concepts are important to water resources research, so these articles are included in this bibliography. Books, journal articles, trade publications, reserach reports, and unpublished reports of on-going research in public and private agencies were the sources for the references. (Buchanan-Davidson--Wisconsin).
W76-03298

THE RECOVERY OF FE, MN AND AL FROM A MINE WATER EFFLUENT,
Potchefstroom Univ., for C. H. E. (South Africa). Dept. of Industrial Chemistry.
S. R. Van Der Walt, R. Van Eldik, and H. G. J. Potgieter.
Water Research, Vol 9, No 10, p 865-868, October, 1975. 5 fig, 8 ref.

Descriptors: *Analytical techniques, Metals, Separation techniques, *Iron, *Manganese, *Aluminum, Effluents, Oxidation, Mine water, Industrial wastes.
Identifiers: *Aluminates, South Africa, Metals recovery.

Some preliminary results are reported on an attempt to devise methods for the removal of Fe, Mn, and Al. The possibilities studied include oxidation, precipitation, complexation and separation by the formation of aluminates at high pH. The mine water investigated contains considerable quantities of Fe, Mn, and Al. Recovery of the pure metals is obstructed by the presence of impurities such as Zn, Ni, Co, Cu and Th. The oxidation of the effluent results in practically complete separation of Fe and Mn, though both fractions contain Al as an impurity. (Hoyle-Vanderbilt)
W76-03312

MINE DRAINAGE POLLUTION REDUCTION BY INHIBITION OF IRON BACTERIA.
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.
F. Walsh, and R. Mitchell.
Water Research, Vol 9, No 5/6, p 525-528, 1975. 1 fig, 5 tab, 6 ref.

Descriptors: *Acid mine water, *Acid bacteria, Iron, *Mine drainage, *Mine wastes, Microbiology, Pollution abatement, Inhibition.
Identifiers: *Metallogenium, *Thiobacillus ferro oxidants.

The effect of increasing influent ferrous iron concentrations on the amount of total iron and acidity released in drainage from coal mine tailings is described. Observed concurrent decrease in effluent Thiobaccilus and Metallogenium population suggests that the increased influent ferrous iron concentration inhibited the catalytic actitivy of the iron bacteria by preventing growth of significant metallogenium populations. A combination of increasing mine influent ferrous iron concentrations with mine sealing may significantly reduce acidity and total iron releases from working or abandoned coal mines. (Hoyle-Vanderbilt)
W76-03314

ENVIRONMENTAL CLEANUP 1975-1985: HUGE NEW COSTS,
F. C. Olds.
Power Engineering, Vol 79, No 9, p 38-45, September, 1975. 2 fig, 4 tab.

Descriptors: *Environmental effects, *Water quality control, Water pollution control, Pollution abatement, Legislation, Federal Water Pollution Control Act, Federal jurisdiction, Costs, Economics.
Identifiers: Zero pollution discharge.

An overview of the costs of environmental cleanup for the past five years and for the next decade is presented. Major federal regulations for both air and water pollution control are summarized. Published figures from agencies showed cleanup costs to be $300 billion. This did not include the $15 to $20 billion of capital to build power plants each year due to environmentally related stretch-outs in schedules or the $4 to $5 billion annually spent to purchase oil to substitute for unfinished nuclear plant. The costs also failed to include those of acid mine drainage, agricultural feed lot runoff, urban storm water runoff problems, zero discharge, and other hydrological and environmental problems. Present laws have proved unworkable and unrealistic. Proposed costs to meet the 'best available technology' standard set forth for 1983 were estimated at $220 billion for 1972 to 1983. If zero discharge is enforced, the impact on land and aquifers from the impoundment of water containing BOD, chemicals and fine solids may be serious. Other costs related to the enforcement of environmental regulations are less direct, such as the cost to industry of pollution abatement, which will be passed on to the consumer in the form of higher prices for various products. (Kramer-FIRL)
W76-03322

COMPUTER CONTROLS PUT 'WASTE' WATER TO GOOD USE,
Central Contra Costa Sanitary District, Walnut Creek, Calif.
For primary bibliographic entry see Field 5D.
W76-03323

WATER AND THE SOUTH FLORIDA ENVIRONMENT,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 5C.
W76-03402

DO HEAVY METALS PREVENT THE AGRICULTURAL USE OF MUNICIPAL SLUDGE,
Royal Danish School of Pharmacy, Copehagen.
For primary bibliographic entry see Field 5E.
W76-03409

THE EFFECTS OF FRESHWATER INFLOWS ON HYDROLOGICAL AND BIOLOGICAL PARAMETERS IN THE SAN ANTONIO BAY SYSTEM, TEXAS,
Texas Parks and Wildlife Dept., Austin, Coastal Fisheries Branch.
For primary bibliographic entry see Field 2L.

W76-03420

THE PROCEEDINGS OF A NATIONAL SYMPOSIUM ON THE STATE OF AMERICA'S DRINKING WATER.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 5F.
W76-03422

THE DEVELOPMENT AND APPLICATION OF THE 1974 DRINKING WATER STANDARDS,
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-03424

AN APPROACH TO PROVISION OF RURAL WATER SUPPLIES,
Conset, Inc., Washington, D.C. National Demonstration Water Project.
For primary bibliographic entry see Field 5F.
W76-03437

TRAINING OPPORTUNITIES AND THE SAFE DRINKING WATER ACT,
Greensboro Public Works, N.C.
For primary bibliographic entry see Field 5F.
W76-03440

REPORT ON ENVIRONMENTAL STUDY INTO THOMSON DAM AND ASSOCIATED WORKS.
Melbourne and Metropolitan Board of Works (Australia).
For primary bibliographic entry see Field 6G.
W76-03448

PRESENT AND FUTURE REQUIREMENTS OF THE CHLOR-ALKALI INDUSTRY FOR EFFECTIVE POLLUTION CONTROL,
Crawford and Russel, Inc., Stamford, Conn.
For primary bibliographic entry see Field 5D.
W76-03497

INDUSTRIAL REQUIREMENTS FOR EFFECTIVE POLLUTION CONTROL. AUTOMOBILE INDUSTRY,
General Motors Corp., Warren, Mich. Environmental Activities Staff.
J. S. Delos.
In: Electrochemical Contributions to Environmental Protection, Theodore R. Beck, et al, editors. The Electrochemical Society, Inc, Princeton, New Jersey, 1972, p 29-39.

Descriptors: *Industries, *Pollution abatement, *Measurement, *Analytical techniques, Equipment, Michigan, Ohio, Waste water(Pollution), Cations, Anions, Organic compounds, Pesticides, Herbicides, Taste, Odor, Toxins, Safety, Effluents, Air pollution, Chromium, Instrumentation, Pollutant identification.
Identifiers: *Automobile industry, Noise, Cyanide.

The present capability and future requirements for analyses of effluents, toxins, noise, and organoleptic properties are discussed. Michigan requires industries that discharge waste water into streams or sewer systems to report information to the Water Resources Commission on 13 cations, 3 anions, 23 specific organic compounds, 11 classes of organic compounds, 11 taste-and-odor compounds, 2 classes of taste-and-odor compounds, 2 herbicides, and 6 pesticides. Ohio adopted a resolution concerning discharge of toxins into state waters which includes safeguards for toxins. Analysis of organic compounds is very complex. Concern for noise pollution is growing. Instrumentation is needed to accurately determine the combined noise exposure during a work day. Odor measurement is subjective, but measurement should be possible. Analysis of air pollution includes carbon dioxide, carbon monoxide, hydrocarbons, nitric acid, nitrogen dioxide, particulate matter, and sulfur dioxide. Available instrumentation is often bulky, expensive, unreliable, and requires specially trained operators. The expressed preference is toward instruments that are small, simple, reliable, portable units that are parameter specific rather than large all-inclusive units designed to measure any parameter. (Buchanan-Davidson--Wisconsin)
W76-03498

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

PROCEEDINGS OF THE CONFERENCE ON INTERDISCIPLINARY ANALYSIS OF WATER RESOURCE SYSTEMS.
American Society of Civil Engineers, New York.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 596, $11.00 in paper copy, $2.25 in microfiche. Conference held June 19-22, 1973 at University of Colorado, Boulder. An American Society of Civil Engineers Research Activity, ASCE Project No 201.07/17-3.72-4, New York, NY, 1975. 403 p, 19 fig, 9 tab, 9 equ, 26 ref, $8.00 J E Flack, ed. OWRT X-126(3757)(1).

Descriptors: *Water resources development, *Management, *Comprehensive planning, *Systems analysis, United States, Economics, Water policy, Decision making, Social aspects, Coordination, Projects, Africa, Reservoirs, Effects, Communication, Great Lakes, Evaluation, Simulation analysis, Alternative planning, Water quality, Geothermal studies, Regions, Long-term planning, Methodology, River basins, Ecology, Universities, Mathematical models, Research.
Identifiers: *Interdisciplinary analysis, Multidisciplinary, Multiobjective, Political science, Socio-economics, Law, Environmental quality, Man-made lakes, Prediction, Mass balance, Imperial Valley(Cal), North Atlantic Study, Maline Creek(Mo), Plan formulation, Choice approach, Wisconsin River, Lower Fraser River(Brit. Columbia), Least cost, Human judgement.

The Water Resources Systems Committee of the American Society of Civil Engineers' Technical Council on Water Resources Planning and Management saw a critical need for developing an interdisciplinary approach to water resources development. This Conference was intended as an effective means of advancing the systems approach in this area. Formal papers on six interdisciplinary efforts were selected as case studies, around which discussions were built. These six papers include interdisciplinary studies on: (1) large reservoirs in Africa; (2) limnological modeling of the Great Lakes; (3) geothermal development; (4) the North Atlantic Regional Water Resources Study; (5) Corps of Engineers planning experience in the St. Louis-Maline Creek; and (6) university research in the Wisconsin River and the Lower Fraser River (Brit. Columbia) water quality studies. Discussions are given after each paper. Included also is an introductory article on the interdisciplinary aspects of water resources planning and management. Panels on discipline viewpoints of interdisciplinary analysis of water resource systems both procede and follow the section containing the formal papers. These present articles on socioeconomics, political science and law, ecology, an overview of interdisciplinary issues, and interdisciplinary planning and the use ofthe systems analysis concept in planning. The overall objective is to discover how many and in what ways disciplines can cooperate and coordinate their efforts leading to improved, comprehensive analysis and eventual solution of our water resources problems. (See W76-00061 thru W7 00080) (Bell-Cornell)
W76-03005

DYNAMIC WATER QUALITY MANAGEME STRATEGIES,
Washington Univ., Seattle. Dept. of Civil E gineering.
For primary bibliographic entry see Field 5G.
W76-03158

ADMINISTRATION: SYSTEMS ANALYS (LITERATURE REVIEW),
Cornell Univ., Ithaca, N. Y. School of Civil Environmental Engineering.
D. P. Loucks.
Journal Water Pollution Control Federation, nual Literature Review, Vol 47, No 6, p 1783-1 June 1975, 41 ref.

Descriptors: *Water pollution con *Management, *Planning, *Design, *Syst analysis, Waste water treatment, Decision ing, Water quality, Bibliographies, Cost-be analysis, Economics, Optimization, Simul analysis, Dynamic programming, Linear gramming, Mathematical models, *Reviews. Identifiers: Cost-effectiveness, Predicting, minimization, Nonlinear programming, squares, Eigen-value perturbation, Parametri ferentiation, Multivariate statistical techni Streeter-Phelps equation, Chance-constr quadratic programming, Mixed-integer gramming.

The 1974 literature on the development and cation of systems analysis techniques for de and evaluating alternative water pollution c policies can be divided into six categorie water quality modeling methods; (2) com simulation studies; (3) metropolitan water q studies; (4) wastewater treatment systems sis; (5) salinity and thermal pollution analysi (6) water quality surveillance planning. This enumerates and briefly summarizes for documents (articles, reports and conf proceedings) pertinent to the field of water tion control and wastewater treatment. writings include a broad spectrum of mathe modeling techniques, such as simulation an linear programming, nonlinear progra dynamic programming, chance-const quadratic programming, and mixed-intege gramming, as well as other optimization me to estimate feasible and often minimu design and management alternatives for quality planning. (Bell-Cornell)
W76-03159

RESERVOIR MANAGEMENT MODELS,
Yale Univ., New Haven, Conn. School ganization and Management.
For primary bibliographic entry see Field 4
W76-03162

ECONOMIC ASSESSMENT OF AN AC ANALYSIS MODEL FOR WATER S PLANNING,
Utah State Univ., Logan. Dept. of Civil vironmental Engineering; and Utah Research Lab., Logan.
For primary bibliographic entry see Field 5
W76-03163

MODELS OF LAND AND WATER A TION TO IMPROVE ENVIRONMEN WATER QUALITY THROUGH SOI CONTROLS,
Iowa State Univ., Ames. Center for Ag and Rural Development; and Iowa Stat Ames. Dept. of Economics.
For primary bibliographic entry see Field
W76-03164

ERVENTION ANALYSIS IN WATER OURCES,
erloo Univ., (Ontario). Dept. of Civil En-ering.
rimary bibliographic entry see Field 2E.
-03165

OF RISK PREMIUMS IN CHANCE-CON-AINED DYNAMIC PROGRAMING,
South Wales Univ., Kensington (Australia). ol of Civil Engineering.
Askew.
r Resources Research, Vol 11, No 6, p 862-December 1975. 3 fig, 2 tab, 2 equ, 4 ref.

riptors: *Water resources development, rations, *Water policy, *Dynamic pro-ming, *Stochastic processes, Probability, unt rates, Economics, Feasibility, Con-ts, Optimization, Costs, Benefits, Forecast-Algorithms, Equations, Systems analysis, ematical models, Risks.
ifiers: *Risk premiums, Benefit maximiza-Chance-constrained programming, Economic ty, Failure penalty, Water release.

astic dynamic programming offers a power-eans of deriving optimum operating policies ater resource systems. In order to limit the bility of system failure associated with such es, it is necessary to ammend the standard al-m and use some form of chance-constrained nic programming. This technique may in-an iterative search based on variations in parameters as the penalty for failure or the nt rate. Use of the latter parameter is found quite feasible and is analogous to the imposi-f risk premiums when one is investing in less ventures: the greater the probability of , the greater the premium demanded. (Bell-ll)
3166

MBER-WATER SIMULATION MODEL LODGEPOLE PINE WATERSHEDS IN COLORADO ROCKIES,
do State Univ., Fort Collins, Dept. of and Wood Sciences.
imary bibliographic entry see Field 4D.
3167

URCE ALLOCATION UNDER UNCER-TY,
rnia Univ., Berkeley. Graduate School of Policy.
Trinkl.
Sciences, Vol 6, p 29-40, 1975. 4 tab.

ptors: *Resource allocation, *Markov ses, *Decision making, *Methodology, studies, Alternative planning, Forecasting, ility, Hawaii, *Risks.

makers face a problem of how to make ns in the real world because of basic uncer-and lack of information. Possible decision nder uncertainty are examined. The con-al approach is to average the available, when combined with sensitivity analysis, ubstantive guidelines. The model described ed on a Markovian resource allocation and, although a single-state process is ed (as applied to the mental health program arded adults in Hawaii), extensions to a age process can readily be made. Besides al requirements for a Markovian approach, values reflecting judgements of decision concerning the relative importance of mul-jectives, are incorporated. The model al-e incorporation of production functions monies expended to anticipated outcomes. h the model is open to criticism, it pro-useful framework for analyzing important ssues by incorporating uncertainties, thus the determination of preferred resource allocations. The framework precludes distinctively inferior courses of action which disguise the inherent nature of uncertainty; and it can be used to point out to decision makers the penalties (measured in achievable value loss) of simplistic arbitrary allocations. (Auen-Wisconsin)
W76-03266

HYDROGRAPHY.
For primary bibliographic entry see Field 4A.
W76-03292

RANGE AND DEFICIT ANALYSIS USING MARKOV CHAINS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2H.
W76-03354

TECHNIQUES FOR WATER DEMAND ANALYSIS AND FORECASTING: PUERTO RICO, A CASE STUDY,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6D.
W76-03407

MATHEMATICAL OPTIMIZATION OF WATER SUPPLY SYSTEMS STATE OF THE ART,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5F.
W76-03441

WATER DEMAND FORECASTING--SOME CONCEPTS AND TECHNIQUES,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5F.
W76-03442

ENERGY COST-BENEFIT MODELS FOR EVALUATING THERMAL PLUMES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W76-03496

6B. Evaluation Process

ENERGY DEMAND AND WATER RESOURCE MANAGEMENT: SOME ECONOMIC ASPECTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6D.
W76-03003

PROCEEDINGS OF THE CONFERENCE ON INTERDISCIPLINARY ANALYSIS OF WATER RESOURCE SYSTEMS.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6A.
W76-03005

REGIONAL DEVELOPMENT: AN ECONOMETRIC STUDY OF THE ROLE OF WATER DEVELOPMENT IN EFFECTUATING POPULATION AND INCOME CHANGES,
Utah Center for Water Resources Research, Logan.
H. H. Fullerton, W. C. Lewis, J. C. Andersen, J. E. Keith, and R. Willis.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 711, $4.50 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory, Logan, Publication PRRBE089-1, June 1975. 50 p, 32 tab, 1 fig. OWRT B-089-UTAH(1). 14-31-0001-4131.

Descriptors: Economics, *Water resources development, Population, *Income, *Investment, *Regional development, *Economic impact, Rocky Mountain region, *Econometrics, Cost analysis, *Cost comparisons, *Regional analysis, Forecasting.
Identifiers: *Economic growth.

Twelve measures of regional economic growth, including population and three measures of income were compared for areas with and without water investment in 246 countries and 42 water resource subareas in the states of Utah, Colorado, New Mexico, Montana, Wyoming, Idaho, and Nevada. Simple mean comparisons for these measures compiled for the decades 1940-1950, 1950-1960, and 1960-1970 failed to support the hypothesis that economic growth of those counties and subareas receiving water investment was significantly higher than in those areas which did not, with the possible exception of the 1940-1950 decade. For small areas in New Mexico where more detailed records of water investment were available, a nine equation econometric model was estimated using three-stage least squares analysis. As specified, this model facilitated an examination of the interactive effect of water development as a causal variable and as an endogenous variable which responds to other growth inducements. Input-output and economic base-models were used to examine two case studies of water investment in Western Colorado. In this analysis it was found that total gross output attributable to the projects ranged from zero in the petroleum and mining sectors to a high of 260,302 in the dairy industry. Multiplicative effects on employment income and gross economic activity ranged from 1.06 to 2.30 times their initial magnitude. Income and employment multipliers were of similar magnitude. The input-output approach shows potential impacts from water investment in a general equilibrium context, but rests on the assumption that other concurrent events which could produce similar or offsetting effects in the region are held constant.
W76-03137

DYNAMIC WATER QUALITY MANAGEMENT STRATEGIES,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-03158

ADMINISTRATION: SYSTEMS ANALYSIS, (LITERATURE REVIEW),
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6A.
W76-03159

RESERVOIR MANAGEMENT MODELS,
Yale Univ., New Haven, Conn. School of Organization and Management.
For primary bibliographic entry see Field 4A.
W76-03162

WATER QUALITY PERCEPTION BY USERS: CAN IT SUPPLEMENT OBJECTIVE WATER QUALITY MEASURES,
Great Lakes Forestry Research Center, Sault Sainte Marie (Ontario).
For primary bibliographic entry see Field 5G.
W76-03168

INTERNATIONAL INVENTORY AND FORECAST OF OFFSHORE PETROLEUM AND MINERAL ACTIVITY,
Gulf Universities Research Consortium, Galveston, Tex.
A. Lohse, and J. R. Crump.
Available from NTIS, Springfield, Va 22161 as AD-A008 431, $5.00 in paper copy, $2.25 in microfiche. Department of Transportation, U.S.

Coast Guard, Washington, D.C., Office of Merchant Marine Safety, Final Report No. GURC-122, February 1973. 87 p, 15 fig, 14 tab, 3 append.

Descriptors: *Census, *Forecasting, *Evaluation, *Exploration, Ships, Drilling equipment, Oil industry, Mineral industry, International waters, Data collections, Safety.
Identifiers: Undersea apparatus, Offshore exploration.

An inventory (at the end of 1972) of equipment owned by U.S. companies and their foreign subsidiaries used for offshore petroleum and mineral exploration and exploitation is provided. Included are oceangoing mobile drilling units, support vessels (tugs, crew-boats, offshore supply vessels, geophysical vessels, pipe laying barges, and derrick barges), and special equipment (submersibles, saturation diving systems, deck decompression chambers, and underwater work chambers). Forecasts of offshore oil and gas production; number of wells drilled, mobile drilling unit and support vessel requirements, depth capability for drilling, diving, and pipe laying, and other industry trends are presented for the period 1972 to 2000. The study is for use in planning to meet the needs of growing offshore industries and the general public in the areas of search and rescue, commercial vessel safety, port safety, aids to navigation, and marine environmental protection. (Sinha-OEIS)
W76-03176

WATER MANAGEMENT IN ENGLAND: A REGIONAL MODEL,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. A. Okun.
Environmental Science and Technology, Vol 9, No 10, p 918-923, October, 1975. 1 tab.

Descriptors: *Administration, *Water management(Applied), *Economics, Regional development, Rivers, Waste water treatment, Water supply, Effluents, Treatment facilities, Financing.
Identifiers: Regional Water Authorities(Great Britain).

The reorganization of water management in England, with its flexibility and cost-effectiveness, is contrasted with the situation in the United States. A history of water management developments in England over the past thirty years is presented. The key agencies of the 1973 Water Act reorganization are the 10 Regional Water Authorities (RWAs). These are based on hydrologic boundaries and optimize systems for all the communities they serve. Responsibilities of RWA headquarters include financing, planning, and water quality monitoring. Each of 152 multifunctional (water supply/rivers/waste water disposal) divisions within the RWAs is responsible for customer services, facilities operation, and design and construction of new facilities. In the United States, where each local authority is responsible for effluent discharges, the regulatory approach is a uniform effluent standard. This policy seems fair but is often uneconomical. In England, where there is a single ownership of all treatment facilities on a given river, an optimization model can indicate a least-cost solution for the entire region. Financing of water pollution control in the United States under the construction grants program (where construction costs are met by federal funds while operation and maintenance costs are met locally) has caused trends towards excessive construction and poor operation. In Great Britain, each water authority determines the construction for that region, (based on financial resources and need), optimizes total costs, and raise all its own funds. (Kramer-FIRL)
W76-03207

PRINCIPLES OF DETERMING A SOCIAL DISCOUNT RATE,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 6C.
W76-03263

RESEARCH NEEDS FOR WATER RESOURCES CONTROL IN CALIFORNIA.
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5G.
W76-03265

EFFLUENT CHARGES, ENVIRONMENTAL QUALITY AND OTHER NATIONAL GOALS: A QUALIFICATION,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-03268

URBAN WATER USE IN AUSTRALIA,
Gutteridge, Haskins and Davey Pty. Ltd., Melbourne (Australia).
For primary bibliographic entry see Field 6D.
W76-03272

DEEPSEA MINERAL UTILIZATION, REGULATION AND ECONOMIC EFFICIENCY,
Delaware Univ., Newark. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W76-03275

ECONOMIC ANALYSIS OF WHEAT PRODUCTION WITH FERTILIZER UNDER ADEQUATE AND LIMITING IRRIGATION WATER,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W76-03277

REALITY AND PROSPECTS OF THE FISHING INDUSTRY IN ITALY,
For primary bibliographic entry see Field 3E.
W76-03279

COMPARATIVE RIST-COST-BENEFIT STUDY OF ALTERNATIVE SOURCES OF ELECTRICAL ENERGY. APPENDIX A: ENERGY EXPENDITURES ASSOCIATED WITH ELECTRIC POWER PRODUCTION BY NUCLEAR AND FOSSIL FUELED POWER PLANTS.
Division of Reactor Research and Development (USERDA), Washington, D.C.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. Price $41.20. Report No. AEC WASH 1224-A, December 1974. 58 p, 9 fig, 32 tab, 22 ref.

Descriptors: *Electric power production, *Cost-benefit analysis, Efficiency, Energy, Nuclear powerplants, Fossil fuels, Energy conversion, Transportation, Mining, Waste disposal, Cooling towers, Power system operation, Transmission(Electrical).
Identifiers: Fossil fueled powerplants.

All energy expenditures in the energy production cycle, from mining fuel to the ultimate disposal of waste products are examined and compared between nuclear and fossil fueled electric generating plants. The energy used in each step of the production process per unit of net electrical energy are estimated. Production methods evaluated are Pressurized Water Reactor (PWR), Boiling Water Reactor (BWR), coal, oil, and natural gas electric plants. Heat energy is introduced into the system, including heat from the fuel in the energy producing process. Some of this energy is wasted as heat loss at the power plant, some as part of the necessary energy input to the process, and some as transmission loss. The balance goes as net ene gy to consumers. The study used a 1000-MWe ne full load generating plant in making the cor parisons. Conclusions reached are: (1) Proce heat requirements are very small compared to he inputs and most heat loss occurs at power pla (2) process electrical requirements are small e cept for light water reactors (LWR) which are the order of 3% to 4% of plant output; (3) LWR ject significantly more heat at the plant; th together with higher process electrical requi ments, results in lower overall efficiency in LW systems. (Carpenter-Wisconsin).
W76-03281

CHANGING WATER USE IN SELECT MANUFACTURING INDUSTRIES,
National Bureau of Economic Research, In Washington, D.C.
For primary bibliographic entry see Field 3E.
W76-03284

THE METROPOLITAN WATER DISTRICT SOUTHERN CALIFORNIA REPORT FOR T FISCAL YEAR JULY 1, 1973 TO JUNE 30, 19
Southern California Metropolitan Water Distr Los Angeles.
For primary bibliographic entry see Field 4A.
W76-03285

COLORADO RIVER AQUEDUCT OPERATI AND MAINTENANCE.
For primary bibliographic entry see Field 4A.
W76-03286

DISTRIBUTION SYSTEM OPERATION A MAINTENANCE.
For primary bibliographic entry see Field 4A.
W76-03287

WATER TREATMENT.
For primary bibliographic entry see Field 4A.
W76-03288

ENGINEERING.
For primary bibliographic entry see Field 4A.
W76-03289

HYDROGRAPHY.
For primary bibliographic entry see Field 4A.
W76-03292

A STRATEGY FOR MANAGEMENT MARINE AND LAKE SYSTEMS WITHIN NATIONAL PARK SYSTEM.
National Park Service, Washington, D.C. C of Natural Science.
For primary bibliographic entry see Field 2L.
W76-03296

BIBLIOGRAPHY OF WATER POLLU CONTROL BENEFITS AND COSTS,
Development Planning and Research Assoc Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-03298

AESTHETIC RESOURCES OF THE COA ZONE.
Mann (Roy) Associates, Inc., Cambridge, Ma
For primary bibliographic entry see Field 2L.
W76-03419

. Cost Allocation, Cost Sharing, Pricing/Repayment

)NOMIC EFFECTS OF LAND SUBSIDENCE : TO EXCESSIVE GROUNDWATER HDRAWAL IN THE TEXAS GULF COAST A,
as A and M Univ., College Station. Water urces Inst.
primary bibliographic entry see Field 4B.
-03099

ERMINING OPTIMAL WELL HARGE,
rado State Univ., Fort Collins.
primary bibliographic entry see Field 4B.
-03118

IONAL DEVELOPMENT: AN ECONOMET- STUDY OF THE ROLE OF WATER ELOPMENT IN EFFECTUATING POPULA- AND INCOME CHANGES,
Center for Water Resources Research, n.
rimary bibliographic entry see Field 6B.
03137

GN OF DRIP IRRIGATION MAIN LINES,
ii Univ., Honolulu. Dept. of Agricultural En- ring.
rimary bibliographic entry see Field 8B.
03160

MUM SIZE OF EQUIPMENT,
ruction Estimating, Inc., West Hartford,
rimary bibliographic entry see Field 8G.
03161

RCEPTOR SEWER COST ANALYSIS,
politan Sanitary District of Greater Chicago, wer Design Section.
Paintal.
and Sewage Works, Vol 122, No 11, p 44, nber, 1975.

iptors: *Sewerage, *Interceptor sewers, *Treatment facilities, Waste water treat- Equations, Engineering, Capital costs, water disposal, Sewers, Regression analy- Cost analysis.

uation has been formulated to determine lationships for interceptor sewers, based on gathered between 1963 and 1974 by the politan Sanitary District of Greater Chicago. alized cost equations for sewers do not However, the cost of a sewage collection is approximately more than half of the cost of waste water disposal facilities. Cost nships for interceptors can be expressed as: gd/mile=a(sewer capacity,mgd) to the bth cost/mile=c (sewer diameter) to the dth or cost/mile=e(service area population) to power. The terms 'a', 'c', and 'e' are con- and 'b', 'd', and 'f' are power exponents, ewer capacity expressed in mgd, sewer er in feet, and service area population in nds. The data were analyzed to include con- n costs only; legal and engineering fees as land acquisition and contingency costs ot included. Regression analysis of the data the equations; cost ngd/mile=280(sewer capacity, mgd) to the - power and cost $1000/mile=250 (sewer r, feet) to the 1.13th power. These regres- es were plotted with the data. To develop ationship between construction cost and area population, it was assumed that the ita sewage contribution was 100 gpd and peak to average sewage flow ratio x, is given by x=5/ p to the 1/6th power (P being the service area population in thousands). By combining the first equation with these assumptions, the following expression was derived: cost $1000/mile=209(service area population in 1000s) to the 0.35th power. (Kramer-FIRL)
W76-03194

DESIGN VALUE IN, WASTE OUT,
McKee-Berger-Mansueto, Inc., Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-03205

PRINCIPLES OF DETERMING A SOCIAL DISCOUNT RATE,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple.
Water Resources Bulletin, Vol 11, No 4, p 811-819, 1975. 2 fig, 20 ref.

Descriptors: *Discount rates, *Government finance, *Risks, *Return(Monetary), *Depreciation, Project life, Amortization, Investment, Inflation, Social aspects.
Identifiers: Public investment, Private investment, Opportunity cost, Corporate income tax.

An examination of the principles suggested by the Water Resources Council in determining discount rates for government investment considers two approaches: The social opportunity cost and the subjective time preference. Generally government projects should yiled the same marginal return as is available in the private sector if there is to be an optimum allocation of society's resources. Government investments may have a lower net risk than private investment generally but this risk is not compensated in the yield on Federal bonds. Socially there seems no basis for regarding the higher but very variable private investment returns more favourably than the lower but much surer returns from Federal bonds. Protection of the interests of future generations is not a relavent consideration in comparing public discount rates to private rates of return. Private sector interest rates are high because of anticipated inflation, adding about 4%; such an item has no place in government discount rates. High corporate taxes mean high interest rates are necessary if reasonable after-tax returns are to be yielded; no such allowance should be made in public project discount rates. Present policy of the Water Resources Council may be overstating the required discount rate by about 3% (in 1975) given the present rate of inflation. (Carpenter-Wisconsin)
W76-03263

ECONOMIC ANALYSIS OF THE INLAND FISHERIES PROJECT IN EL SALVADOR,
Auburn Univ., Ala. International Center for Aquaculture.
For primary bibliographic entry see Field 6E.
W76-03264

RESIDUAL CHARGES AND PROFITS,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-03267

A SOCIOLOGICAL ASSESSMENT OF ECONOMIC INCENTIVES FOR INDUSTRIAL POLLUTION ABATEMENT,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-03269

FINANCIAL INCENTIVES AND POLLUTION CONTROL. A CASE STUDY,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W76-03270

DEEPSEA MINERAL UTILIZATION, REGULATION AND ECONOMIC EFFICIENCY,
Delaware Univ., Newark. Dept. of Economics.
L. G. Anderson.
Marine Technology Society Journal, Vol 9, No 4, p 17-19, 1975.

Descriptors: *Mining, *Oceans, Regulation, *Economic efficiency, Mineralogy, Exploitation, Equitable apportionment.
Identifiers: *Deepsea resources, Nodules, Free access.

Logue, Sweeney, and Petrou in discussing possible functions of an International Seabed Resources Authority concluded that free market production of deepsea minerals is necessary for efficiency. This may be true on efficiency grounds but it also depends on economic variables. Distribution and efficiency cannot be separated. Deepsea mineral exploitation of nodules does not fit the model, because there are no property rights to the sea floor and the small number of existing firms desiring and capable of deepsea production encourages behavior closer to monopolistic than competitive. A strong regulatory agency may be required, to achieve proper intertemporal use of deepsea minerals. Economic theory alone cannot provide enough information to determine if an efficient free-access free-timing system with possible property rights and monopoly problems or a regulated system with positive regulation expenses and the possibility of political objectives as the primary goal is preferred on efficiency grounds. Distributional aspects must also be considered. The scheme best for the United States may not be best for other countries. Choice of the proper regime for deepsea utilization of mineral resources is not simple, even considering economic efficiency alone when distribution or equity are involved. (Buchanan-Davidson--Wisconsin)
W76-03275

ECONOMIC ASPECTS OF GEOELECTRICAL PROSPECTING IN SANDSTONE AQUIFERS,
Birmingham Univ. (England). Dept. of Geological Sciences.
For primary bibliographic entry see Field 4B.
W76-03276

HOUSEHOLD TECHNOLOGY AND THE DOMESTIC DEMAND FOR WATER,
National Institute of Economic and Social Research, London (England).
For primary bibliographic entry see Field 6D.
W76-03278

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA REPORT FOR THE FISCAL YEAR JULY 1, 1973 TO JUNE 30, 1974.
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 4A.
W76-03285

STATE WATER PROJECT.
For primary bibliographic entry see Field 4A.
W76-03290

CONSTRUCTION.
For primary bibliographic entry see Field 4A.
W76-03291

PURCHASING, PERSONNEL, AND RIGHT OF WAY.
For primary bibliographic entry see Field 4A.
W76-03294

FINANCING.
For primary bibliographic entry see Field 4A.
W76-03295

ENVIRONMENTAL CLEANUP 1975-1985: HUGE NEW COSTS,
For primary bibliographic entry see Field 5G.
W76-03322

ASPECTS OF WATERWORKS PUMPING PLANT DESIGN,
For primary bibliographic entry see Field 8C.
W76-03324

PROBLEMS IN SMALL WATER SYSTEMS,
North Carolina Dept. of Human Resources, Raleigh. Div. of Health Services.
For primary bibliographic entry see Field 5F.
W76-03432

FINANCIAL CONSIDERATIONS FOR RURAL WATER SYSTEMS,
Farmers Home Administration, Washington, D.C.
For primary bibliographic entry see Field 5F.
W76-03433

WATER RATES: AN ASSESSMENT OF CURRENT ISSUES,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5F.
W76-03439

6D. Water Demand

ENERGY DEMAND AND WATER RESOURCE MANAGEMENT: SOME ECONOMIC ASPECTS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Economics.
D. K. Lyon.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 456, $6.00 in paper copy, $2.25 in microfiche. Completion Report, No A E Res 75-32, December 1975. 124 p, 26 tab, 6 fig. OWRT B-045-NY(1). 14-31-0001-5096.

Descriptors: *Water resources, *Management, *Energy, *Demand, *Economics, River basins, Electric power industry, Water allocation(Policy), Optimization, Powerplants, Cooling, Mathematical models, Systems analysis.
Identifiers: *Susquehanna River basin, Cost minimization, Mixed-integer programming, Water withdrawal.

A general economic model is developed which uses mixed-integer programming to minimize the cost of water withdrawals to the electricity generating industry. The model is placed in the context of a river basin and indicates the amount of water to be allocated for power plant cooling systems, given an exogenously determined level of electricity demand. The model is applied to a study region, the Susquehanna River Basin. Several parameters affecting the model results are tested. Among those tested in the analysis are various electricity forecast scenarios, withdrawal level policy and thermal regulations. The model may be expanded in order to analyze other policies and to include other sectors in the objective function, in addition to the electricity industry. (Kalter-Cornell)
W76-03003

URBAN WATER USE IN AUSTRALIA,
Gutteridge, Haskins and Davey Pty. Ltd., Melbourne (Australia).
C. R. Weeks, I. E. Aust, T. A. McMahon, and M. I. Aust.
Institution of Engineers, Australia, Civil Engineering Transactions, Vol 16, No 1, p 58-66, 1974. 6 fig, 10 tab, 41 ref.

Descriptors: *Australia, *Water utilization, *Cities, Water demand, Forecasting, Industrial water, Domestic water, Use rates.
Identifiers: Multivariate analysis, Household water use, Garden watering.

Water use data, considered useful to design engineers concerned with urban water supply systems is presented. The project was primarily developed to evaluate factors affecting residential and industrial water use in Australia and data from 14 Australian cities was collated and analysed. Part I examines factors influencing annual urban water use and its seasonal variations. These factors include population size, metering, water quality, and climate effects. Water demands for 1985 are predicted for 11 Australian cities, using trend extrapolation. Monthly consumption and climatic variables are related through multivariate analysis. Part II provides residential usage based on five small study areas. These results are used to detail characteristics of household and garden water usage. Part III discusses characteristics of industrial water use in Melbourne. Water use per unit of production for 29 processes is tabulated. (Carpenter-Wisconsin)
W76-03272

HOUSEHOLD TECHNOLOGY AND THE DOMESTIC DEMAND FOR WATER,
National Institute of Economic and Social Research, London (England).
R. A. Batchelor.
Land Economics, Vol 51, No 3, p 208-223, 1975. 3 fig, 3 tab, 23 ref.

Descriptors: *Water demand, *Forecasting, *Domestic water, Pricing, Econometrics, Water rates, Elasticity of demand, Water utilization, Model studies, Europe.
Identifiers: Metering of water, England.

Traditionally the demand for household water in the United Kingdom has been met in full without any use of restrictions via a charge based on use of water. Changind conditions due to rapid economic growth and anticipated costs of new water supply projects require a new approach. Metering is now being actively considered as an option. This study examines the impact of metering of water usage on the household consumption by estimating a demand function for water usage by an econometric study of household demand for water in Melvern, England, the only place where water is presently metered. The models uses the 'new' theory based on the 'characteristics' of the good demanded. The idea that water demand may be significantly influeced by variations in household technology based on income, is the central theme of the study. The identifying technological changes are the introduction of water-using appliances into activities which were previously either manual (clothes and dish washing, etc.) and wholly external to the household (transport). A dynamic characteristic of water demand--the tendency for wealth elasticities to rise as washing machines and cars are accumulated--is pretinent to the metering decision. (Carpenter-Wisconsin)
W76-03278

COMPUTER PRINT-OUT SHEETS. USER'S MANUAL, INTEGRATED AMMONIA MODEL.
Houston Univ., Tex.
For primary bibliographic entry see Field 5D.
W76-03282

AN APPLICATION OF DISCRIMINANT ANALYSIS TO DETERMINE THE DEMAND FOR INDUSTRIAL FLOOD PLAIN LOCATION,
Missouri Univ., St. Louis. School of Business Administration.
For primary bibliographic entry see Field 6F.
W76-03283

CHANGING WATER USE IN SELEC MANUFACTURING INDUSTRIES,
National Bureau of Economic Research, Washington, D.C.
For primary bibliographic entry see Field 3E.
W76-03284

WATER RESOURCES OF WEST-CENT MISSOURI,
Geological Survey, Rollo, Mo.
For primary bibliographic entry see Field 7C.
W76-03401

TECHNIQUES FOR WATER DEMAND AN SIS AND FORECASTING: PUERTO RIC CASE STUDY,
Geological Survey, Reston, Va.
E. D. Attanasi, E. R. Close, and M. A. Lopez.
Open-file report 75-94, 1975. 76 p, 1 fig, 17 t ref, append.

Descriptors: *Water demand, *Water reso development, *Water supply, *Puerto *Forecasting, Model studies, Systems ana Analytical techniques, Water users, Water u tion, Planning.

The rapid economic growth of the Commonv of Puerto Rico since 1947 has brought public sure on Government agencies for rapid de ment of public water supply and waste trea facilities. This report is part of a 2-year co tive study by the U.S. Geological Survey a Environmental Quality Board of the Com wealth of Puerto Rico, for the developm systems analysis techniques for use in resources planning. The report reviews the i tional structure associated with water res planning for the Commonwealth. A brief de tion of alternative water demand forec procedures is presented and specific tech and analyses of Puerto Rico demand da discussed. Models provide a framework fo ing several sets of water demand forecasts on alternative economic and demographic as tions. The historical impact of water resour vestment on regional economic developm analyzed and related to water demand forec (Woodard-USGS)
W76-03407

WATER DEMAND FORECASTING— CONCEPTS AND TECHNIQUES,
North Carolina Univ., Chapel Hill. Dept. vironmental Sciences and Engineering.
For primary bibliographic entry see Field 5F
W76-03442

6E. Water Law and Institution

WATER SUPPLIES FOR LOW-INCOME MUNITIES IN DEVELOPING COUNTRIE
Birmingham Univ. (England). Dept. of Ci gineering.
For primary bibliographic entry see Field 5F
W76-03114

WATER MANAGEMENT IN ENGLAND: GIONAL MODEL,
North Carolina Univ. at Chapel Hill. Dept vironmental Sciences and Engineering.
For primary bibliographic entry see Field 6
W76-03207

PRIVATE CONSTRAINTS ON GR WATER CONTAMINATION,
Virginia Polytechnic Inst. and State Blacksburg. Water Resources Research Ce
For primary bibliographic entry see Field 4

03244

WE AFFORD ZERO POLLUTION RISK,
Univ. at Austin. Dept. of Civil Engineering.
rimary bibliographic entry see Field 5G.
03249

NOMIC ANALYSIS OF THE INLAND
ERIES PROJECT IN EL SALVADOR,
rn Univ., Ala. International Center for
culture.
McCoy.
ct A.I.D./la-688, January 1974. 50 p, 8 fig, 4
ref.

iptors: *Aquiculture, *Foreign countries,
omic impact, Marketing, Pricing, Human
ces, Diets, Productivity, Freshwater fish,
ation, Lake fisheries, Return(Monetary),
arvest, Tilapia, Employment, Fish farming.
fiers: *El Salvador, *Inland Fisheries Pro-
id for International Development.

ccomplishments and potential of an Aid for
ational Development inland fisheries project
Salvador are described. Over a two year
, a Fisheries Station at Santa Cruz Porrilo
ompleted together with a survey of lakes,
and farm pond culture. Research into the
ility of increasing harvests from the national
of El Salvador was conducted, community
developed, the Fisheries Service expanded
active program of dissemination fisheries
ation to prospective fish farmers instituted.
arketing methods are detailed. Two major
ns still exist: Lack of funds which severely
levelopments and construction; a shortage
ed personnel. However, prospects of the
of the Fisheries Project are encouraging:
number of individuals are at present un-
g technical training; (2) favourable climatic
ons in El Salvador, with an assured water
and a polyculture system utilizing supple-
y feeding promise very high production
(3) multiple-pond developers will require
us enhancing the domestic water supply.
e employment coupled with a higher
diet may help to improve the educational
a proportion of the population. Intensive
lture represents one means to supply the
m return of protein for high population
and limited land resources. (Carpenter-
sin)
264

ONMENT LAWS MAY CLOSE MANY
SH FACTORIES.
nary bibliographic entry see Field 5G.
273

WATER PROJECT.
nary bibliographic entry see Field 4A.
290

ary bibliographic entry see Field 4A.
293

RY, FINAL REPORT 1975, OREGON
L CONSERVATION AND DEVELOP-
OMMISSION.
ary bibliographic entry see Field 2L.
18

OCEEDINGS OF A NATIONAL SYM-
ON THE STATE OF AMERICA'S
NG WATER.
arolina Water Resources Research Inst.,

ary bibliographic entry see Field 5F.
22

IMPACT OF THE SAFE DRINKING WATER ACT,
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-03423

THE DEVELOPMENT AND APPLICATION OF THE 1974 DRINKING WATER STANDARDS,
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-03424

EPIDEMIOLOGY OF WATERBORNE DISEASE IN THE UNITED STATES 1971-1973,
Center for Disease Control, Atlanta, Ga. Bureau of Epidemiology.
For primary bibliographic entry see Field 5F.
W76-03426

EVALUATING STATE DRINKING WATER QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5F.
W76-03430

LEGAL CONTROLS FOR PROTECTING UNDERGROUND SOURCES OF DRINKING WATER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5F.
W76-03435

AN APPROACH TO PROVISION OF RURAL WATER SUPPLIES,
Conset, Inc., Washington, D.C. National Demonstration Water Project.
For primary bibliographic entry see Field 5F.
W76-03437

TRAINING OPPORTUNITIES AND THE SAFE DRINKING WATER ACT,
Greensboro Public Works, N.C.
For primary bibliographic entry see Field 5F.
W76-03440

6F. Nonstructural Alternatives

TWO DECADES OF FLOOD-PLAIN MANAGEMENT: THE TVA REGIONAL EXPERIENCE,
Tennessee Valley Authority, Knoxville. Local Flood Relations.
G. R. Wall.
In: Virginia Polytechnic Institute and State University, Blacksburg, Extension Division Publication No 629, p 91-97, 1974.

Descriptors: *Flood plains, *Urbanization, *Flood damage, *Tennessee Valley Authority, Decision making, Management, Flood control, Land use.

The evolution of the Tennessee Valley Authority's Local Flood Relations Program for flood control is described. Major elements of the approach are in organizing various citizens groups and in preparing codes and ordinances including flood plain regulations. Structural measures are used in non-tradiational ways to bring about other actions. In all cases, flood plain regulations are essential elements. The program has demonstrated that flood damages can be reduced markedly by cooperative action. This is not done by either eliminating all uses of the flood plain or by eliminating floods. Rather it is accomplished by using a variety of closely coordinated elements. Effective federal-state-local cooperative programs permit each level of action to complement the others. The use of prudent planning is emphasized and a planning outline process used effectively in the Tennessee Valley is one derived from a problem-solving technique. The stepts involved are: (1) Recognize the problem; (2) define the problem; (3) enumerate alternatives; (4) evaluate limitations and disadvantges; (5) search for modifications; (6) reevaluate limitations and disadvantages; (7) narrow alternatives; (8) decide on solutions; and (9) take action. The point made is that flood plains should be used--but for a purpose compatible with local, regional, and national objectives. (Auen-Wisconsin)
W76-03271

AN APPLICATION OF DISCRIMINANT ANALYSIS TO DETERMINE THE DEMAND FOR INDUSTRIAL FLOOD PLAIN LOCATION,
Missouri Univ., St. Louis. School of Business Administration.
A. Corbeau, and C. F. Meyer.
Available from the National Technical Information Service, Springfield, Va 22161. Army Engineer Institute for Water Resources Report No IWR 74-P8, December 1974. 55 p, 34 ref, 2 append. DACW 73-73-C-0044.

Descriptors: *Flood plains, Analytical techniques, *Industries, *Locating, Risk, Sites, Attitudes, Motivation, Flood frequency.
Identifiers: Factor analysis, Discriminant analysis, St. Louis(Mo).

To identify the factors which motivate firms to locate on flood plains data on the characteristics of manufacturing and commercial firms in the St. Louis area were gathered and analyzed to determine and quantify statistical differences between firms located on and off flood plains. The research was divided into four major areas: (1) Data collection: three hundred firms were interviewed and information on sales, shipping costs, employee costs, and size of site were compiled; (2) isolation of potential classification variables, using the statistical technique of factor analysis; (3) determination of classification functions (which included flood risk) to decide if a firm was either off or on a flood plain; and (4) simulation of these functions to determine the effect of flood risk on location decisions. The principal finding of this effort is that there is significant statistical difference between both manufacturing and commercial firms located on and off flood plains. The difficulty encountered during the simulation phase of the study was due to the nature of the flood risk data. By attempting to quantify flood hazard by the use of flood frequencies, an arbitrary but constant characteristic was required to be imposed on the off flood plain observations. (Carpenter-Wisconsin).
W76-03283

FLOOD PLAIN INFORMATION: PETERS CREEK, BIRCHWOOD, ALASKA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-03454

FLOOD PLAIN INFORMATION: SOUTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento , Calif.
For primary bibliographic entry see Field 4A.
W76-03455

FLOOD PLAIN INFORMATION: WILDCAT CREEK, MANHATTAN, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W76-03456

FLOOD PLAIN INFORMATION: ROARING BROOK, AVON, CONNECTICUT.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-03457

FLOOD PLAIN INFORMATION: ESCONDIDO CREEK, SAN DIEGO COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-03458

FLOOD PLAIN INFORMATION: RILLITO RIVER AND PANTANO WASH, VICINITY OF TUCSON, ARIZONA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-03459

FLOOD PLAIN INFORMATION: BIG CREEK, LOST CREEK, CHRISTIAN CREEK AND WHITEMAN'S CREEK, JONESBORO, ARKANSAS.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W76-03460

SPECIAL FLOOD HAZARD INFORMATION REPORT: BEAR CREEK, DENVER METROPOLITAN AREA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-03461

FLOOD PLAIN INFORMATION: CACHE LA POUDRE RIVER, COLORADO, VOLUME II, GREELEY, WELD COUNTY.
Corps of Engineers, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-03462

6G. Ecologic Impact Of Water Development

DIVERSITY AND OVERLAP AS MEASURES OF ENVIRONMENTAL QUALITY,
Woods Hole Oceanographic Institution, Mass.
R. L. Haedrich.
Water Research, Vol 9, p 945-952, 1975. 6 fig, 1 tab, 55 ref.

Descriptors: *Environmental effects, *Life cycles, Seasonal, Population, Methodology, *Massachusetts, Bays, Estuaries.
Identifiers: *Diversity, *Overlap, *Environmental quality, Environmental impact statements.

Using the indices of diversity (H) and overlap (PS) together was suggested to assess environmental quality. The method was tested using data on demersal fishes from Massachusetts estuaries and embayments. Annual diversity ranged from H (loge)=0.4-2.4 with low diversities in areas of apparent high pollution and higher diversities in areas of lesser pollution. Where annual diversity was low, little seasonal change was reflected in a high PS from season to season; where annual diversity was high, a relatively lower PS indicated a greater degree of change. This data was suggested for use in environmental impact statements. (Klein)
W76-03024

LONG-TERM EFFECTS OF 4-AMINOPYRIDINE EXPOSURE TO BIRDS AND FISH,
Bureau of Sport Fisheries and Wildlife, Denver, Colo. Denver Wildlife Research Center.
For primary bibliographic entry see Field 5C.
W76-03043

ECOLOGY, ECONOMY AND MINING IN VERMONT,
For primary bibliographic entry see Field 5G.
W76-03061

UNCONVENTIONAL NUCLEAR POWER PLANT SITING OPTIONS AND WATER RESOURCE IMPACTS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W76-03135

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF NEARSHORE ZONE OF SAND KEY, FLORIDA, PRIOR TO BEACH RESTORATION. VOLUME I,
National Marine Fisheries Service, Panama City, Fla. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 2L.
W76-03177

OPTIMAL POLLUTION CONTROL WITH A NONCONSTANT EXPONENTIAL RATE OF DECAY,
Guelph Univ., (Ontario). Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-03206

ENVIRONMENTAL CLEANUP 1975-1985: HUGE NEW COSTS,
For primary bibliographic entry see Field 5G.
W76-03322

WATER AND THE SOUTH FLORIDA ENVIRONMENT,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 5C.
W76-03402

REPORT ON ENVIRONMENTAL STUDY INTO THOMSON DAM AND ASSOCIATED WORKS.
Melbourne and Metropolitan Board of Works (Australia).
Report No. MMBW-W0051, July 1975. 2 vol, 296 p, 21 fig, 13 append.

Descriptors: *Environmental effects, *Reservoir construction, *Australia, Dams, Water supply, Ecology, Habitats, Land use, Recreation, Watersheds(Basins), River regulation, Water quality, Watershed management, Water yield, *Water supply development, Pre-impoundment.
Identifiers: *Environmental impact statements, Thomson River(Vic.), Lower Yarra River(Vic.), Melbourne(Vic.)

The proposed Thomson Dam construction is the third stage in development of the Thomson and Lower Yarra catchments for augmenting water supplies for metropolitan Melbourne (Australia). An environmental impact study is reported in two parts (corresponding to Volumes 1 and 2 respectively): a description of the proposed works with a survey of the existing physical, biological and social features of the area; and estimates of the environmental implications of the works when established. Factors considered in the second part include streamflow and water quality; vegetation, habitat and wildlife effects; and implications for primary production, recreation and tourism in the area. Some further studies necessary to ensure effective use of the development are outlined. (CSIRO)
W76-03448

7. RESOURCES DATA

7A. Network Design

U.S. IFYGL SHIPBOARD DATA ACQUISITION SYSTEM,
International Field Year for the Great Lakes Project Office, Rockville, Md.
For primary bibliographic entry see Field 2H.
W76-03416

7B. Data Acquisition

WINTER SOIL WATER DYNAMICS,
Alaska Univ., College. Inst. of Water Resourc
For primary bibliographic entry see Field 2G.
W76-03002

WATER QUALITY IN IOWA STREAMS: S
MARY OF A CONFERENCE HELD MA
1975.
Iowa State Univ., Ames. Dept. of Animal Eco
For primary bibliographic entry see Field 5A.
W76-03004

METHOD AND APPARATUS FOR DETECT
THE DEGREE OF CONTAMINATION
WASTE WATER,
Katsuhiki Hayashi, Tokyo (Japan). (Assignee
For primary bibliographic entry see Field 5A.
W76-03014

IMPROVED FLOWING WATER APPARA
FOR THE CULTURE OF BRACHYURAN C
LARVAE,
Oregon State Univ., Newport. Marine Sc
Center.
For primary bibliographic entry see Field 5A.
W76-03035

APPARATUS FOR CONTINUOUSLY SATU
ING WATER WITH HYDROPHOBIC ORG
CHEMICALS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A
W76-03047

METHOD OF ESTIMATING MAXI
WATER-HOLDING CAPACITY IN SHAL
SOIL IN A WATERSHED BY PORT
SEISMIC PROSPECTING EQUIPMENT,
For primary bibliographic entry see Field 2G
W76-03063

A LABORATORY INVESTIGATION OF
EFFECT OF SURFACE FILMS ON WIN
DUCED REAERATION,
Massachusetts Univ., Amherst. Water Res
Research Center.
For primary bibliographic entry see Field 5B
W76-03100

FLUOMETURON AND WATER CONTEN
TRIBUTIONS DURING INFILTRATION:
SURED AND CALCULATED,
Oklahoma State Univ., Stillwater. De
Agronomy.
For primary bibliographic entry see Field 5B
W76-03123

TREES AS ENVIRONMENTAL SE
MONITORING LONG-TERM HEAVY M
CONTAMINATION OF SPOKANE R
IDAHO,
Washington State Univ., Pullman. Dept. of
cal and Nuclear Engineering.
For primary bibliographic entry see Field 5A
W76-03320

APPLICATION OF REMOTE-SE
TECHNIQUES TO THE STUDY OF SEA
SNOW COVER,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2C
W76-03389

GLACIER APPLICATIONS OF
IMAGERY,
Geological Survey, Tacoma, Wash.

primary bibliographic entry see Field 2C.
6-03390

W WAYS TO MONITOR THE MASS AND EAL EXTENT OF SNOW COVER,
ological Survey, Tacoma, Wash.
primary bibliographic entry see Field 2C.
5-03391

EVER-OPERATED EKMAN GRAB,
sgow Univ. (Scotland). Field Station.
). Slack.
hwater Biol, Vol 2, No 4, p 401-405, 1972,

criptors: *Sampling, Monitoring, Equipment, rumentation.
tifiers: *Ekman Grab.

ew type of Ekman Grab is described in which need for a messenger weight is eliminated, im-ing its operation under non-static conditions.--yright 1973, Biological Abstracts, Inc.
-03392

ATER CONDUCTIVITY RECORDER,
monwealth Scientific and Industrial Research nization, Clayton (Australia). Div. of Chemi-hysics.
primary bibliographic entry see Field 5A.
-03453

SELECTIVE ELECTRODES IN ENVIRON-TAL RESEARCH,
ouri Univ., Columbia. Dept. of Chemistry.
primary bibliographic entry see Field 5A.
03499

APPLICATION OF SEMICONDUCTOR POUNDS AS INDICATOR ELECTRODES,
je Univ. (Yugoslavia). Center for isotopes Application in Science and Indus-

rimary bibliographic entry see Field 5A.
03500

Evaluation, Processing and ublication

H PLATTE RIVER FLOW CORRELA-S,
ado State Univ., Fort Collins. Dept. of Civil eering.
rimary bibliographic entry see Field 4B.
03117

OCHASTIC-CONCEPTUAL ANALYSIS OF DIMENSIONAL GROUNDWATER FLOW ONUNIFORM HOMOGENEOUS MEDIA,
Columbia Univ., Vancouver. Dept. of gical Sciences.
imary bibliographic entry see Field 2F.
3128

OF RISK PREMIUMS IN CHANCE-CON-INED DYNAMIC PROGRAMING,
South Wales Univ., Kensington (Australia). of Civil Engineering.
imary bibliographic entry see Field 6A.
3166

AND WEEKLY UPWELLING INDICES, COAST OF NORTH AMERICA, 1967-73.
al Marine Fisheries Service, Monterey, Pacific Environmental Group.
mary bibliographic entry see Field 2L.
3179

ANNOTATED BIBLIOGRAPHY OF NOAA PUBLICATIONS OF HYDROMETEOROLOGICAL INTEREST,
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 2B.
W76-03183

SURFACE WAVE DATA RECORDED IN LAKE ONTARIO DURING IFYGL,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
P. C. Liu, and T. A. Kessenich.
NOAA Technical Memorandum ERL GLERL-2, March 1975. 197 p, 1 fig, 1 tab, 3 ref, 4 append.

Descriptors: *Lake Ontario, *Waves(Water), *Ocean waves, Surface waters, Great Lakes, Hydrography, Hydrology, Currents(Water), Wavelengths, Tides, *Data collections.
Identifiers: Surface waves, *Surface wave data, Wave statistics, *Wave data analysis, Wave recordings, Waverider buoys, Wave heights, Wave periods, Lake currents.

This report presents surface wave data recorded by the four waverider buoys deployed along the main axis of Lake Ontario during 1972. The presentation is given in the form of daily summaries of hourly wave statistics generated from a computerized wave data analysis system. In addition to providing systematic information on Lake Ontario surface waves, this report can also be used as an index to digitized wave data for further studies. (NOAA)
W76-03184

NEW YORK BIGHT PROJECT, WATER COLUMN SAMPLING CRUISES NO 1-5 OF THE NOAA SHIP FERREL, AUGUST-NOVEMBER 1973,
National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office.
J. B. Hazelworth, B. L. Kolitz, R. B. Starr, R. Charnell, and G. A. Berverian.
Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. MESA Report No 74-2, July 1974. 191 p, 1 fig, 1 tab, 8 ref.

Descriptors: *Currents(Water), *Water circulation, *Ocean circulation, *Current meters, Flow measurement, Cruises, *Water sampling, Turbidity, Water temperature, Salinity, Water quality, New York, *Data collections, Measurement, Nutrients.
Identifiers: *New York Bight, Water column sampling, Oceanographic cruises, Marine ecosystem, Physical oceanographic data, Nutrient data.

During the period August - November 1973, a series of five oceanographic cruises were made by the NOAA ship Ferrel in the New York Bight. These cruises aare the first in a series of monthly cruises scheduled to last through 1975. Emphasis was given to collecting physical, chemical, and geological data. The objective of the cruises was to supply data to base analysis of the water movements on the highly impacted ecosystem. This report presents the corrected data from these five cruises and describes the parameters measured, the measurements methods, and correction applied to the data. (NOAA)
W76-03187

CHEMICAL TREATMENT FOR PHOSPHATE CONTROL,
California Univ., Berkeley. Div. of Hydraulic and Sanitary Engineering.
For primary bibliographic entry see Field 5D.
W76-03242

COMPUTER PRINT-OUT SHEETS. USER'S MANUAL, INTEGRATED AMMONIA MODEL.
Houston Univ., Tex.
For primary bibliographic entry see Field 5D.
W76-03282

STUDIES OF SELECTED PRECIPITATION CASES FROM METROMEX.
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W76-03353

SECULAR CHANGES IN SOUTH AFRICA RAINFALL: 1880 TO 1972,
University of the Witwatersrand, Johannesburg (South Africa).
For primary bibliographic entry see Field 2B.
W76-03367

THE ASSIGNMENT OF RAINFALL STATIONS INTO HOMOGENEOUS GROUPS: AN APPLICATION OF PRINCIPAL COMPONENT ANALYSIS,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
For primary bibliographic entry see Field 2B.
W76-03368

OPTIMAL IDENTIFICATION OF PARAMETERS IN AN INHOMOGENEOUS MEDIUM WITH QUADRATIC PROGRAMMING,
California Univ., Los Angeles.
For primary bibliographic entry see Field 2F.
W76-03369

WATER QUALITY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W76-03395

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1975,
Geological Survey, Garden Grove, Calif.
J. H. Koehler.
Open-file map, 1975, 1 sheet.

Descriptors: *Maps, *Water levels, *Groundwater, *Water wells, *California, Aquifers, Contours, Seasonal, Spring, Hydrologic data.
Identifiers: *Antelope Valley(Calif).

This map of the Antelope Valley-East Kern Water Agency area, California, shows groundwater subunits and areas, location of wells, and water level contours for spring 1975. The water-level contour intervals are 10, 25, 50, and 100 feet. Datum is mean sea level. (Woodard-USGS)
W76-03396

HURRICANE AGNES RAINFALL AND FLOODS, JUNE-JULY 1972,
Geological Survey, Reston, Va; and National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2E.
W76-03397

MAP SHOWING GROUND-WATER CONDITIONS IN THE WATERMAN WASH AREA, MARICOPA AND PINAL COUNTIES, ARIZONA--1975,
Geological Survey, Phoenix, Ariz.
E. E. Denis.
Arizona Water Commission, Phoenix, Hydrologic Map Series Map H-1, August 1975. 3 sheets.

Descriptors: *Groundwater resources, *Aquifers, *Water levels, *Water quality, *Arizona, *Maps, Hydrologic data, Water wells, Hydrogeology, Specific conductivity, Fluorides.
Identifiers: Waterman Wash area(Ariz).

Three maps showing groundwater conditions in the Waterman Wash area, Arizona--1975, include (1) specific conductance and fluoride concentration, (2) depth to water, well depth, and altitude of the water table, and (3) change in water level, 1966-75, and irrigated area. In the area the annual average maximum daily air temperature is about 88 deg F, and the optimum concentration of fluoride in drinking water is 0.7 mg/litre. About the upper 600 ft of alluvium is composed of poorly consolidated silt, sand, and gravel interbedded with many clay layers; below about 600 ft and to a depth of at least 1,600 ft, the alluvium is composed of semiconsolidated sand and gravel and contains very little clay. Groundwater occurs under water-table conditions in most of the area. The withdrawal of groundwater has resulted in a general decline in water levels. Water-level declines in measured wells for 1952-75 ranged from nearly 172 ft to less than 8 ft. (Woodard-USGS)
W76-03399

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska.
P. J. Still.
Open-file report (Basic Data), 1975. 19 ref, 1 fig, 1 tab.

Descriptors: *Water quality, *Surface waters, *Alaska, Indexing, Basic data collections, Chemical analysis, Sampling, Sites, *Maps, Documentation, Information retrieval.
Identifiers: Southeast Alaska, Surface water quality index.

The U.S. Geological Survey has collected and analyzed water-quality samples from surface waters of the State of Alaska since 1949. This report lists all sites in southeast Alaska for which water-quality data are available and the types of data which have been collected. The location of sampling sites is shown on a map (scale: 1 inch equals about 26.7 kilometres). All of the data listed in this index can be retrieved in tabular form. Retrieval can be made for individual stations or for series of stations by station number or in latitude-longitude sequence. Questions regarding costs or procedures for computer retrieval or other information regarding the data listed in this index should be addressed to: District Chief, U. S. Geological Survey, Water Resources Division, 218 E Street, Anchorage, Alaska 99501. (Woodard-USGS)
W76-03400

WATER RESOURCES OF WEST-CENTRAL MISSOURI,
Geological Survey, Rollo, Mo.
E. E. Gann, E. J. Harvey, J. H. Barks, D. L. Fuller, and D. E. Miller.
Hydrologic Investigations Atlas HA-491, 1974. 4 sheets, 46 ref.

Descriptors: *Water resources, *Water quality, *Water utilization, *Hydrologic data, *Missouri, *Maps, Hydrographs, Surface waters, Groundwater, Water yield, Streamflow, Water wells, Aquifer characteristics, Planning, Land use, Urbanization, Recreation facilities, Water demand, Projections.
Identifiers: West-Central Missouri.

Future development in west-central Missouri is expected to result from continued urban expansion and from increasing recreational use of the four large reservoirs either completed or under construction. Knowledge of the water resources is necessary in planning the use and development of the area. This atlas presents a general summary of information concerning the occurrence, availability, use, and quality of water. A general definition of existing and potential problems related to the development of the water resources is also included. The atlas covers approximately 18,000 sq mi and includes all or parts of 35 counties. The area is bounded on the north by the south edge of the Missouri River flood plain, on the east by the eastern drainage divides of the Osage and Neosho River basins, and on the west and south by the Missouri State line. Water resources of the Missouri River valley are described in the published atlases shown on the index map. (Woodard-USGS)
W76-03401

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
R. D. Steger.
Open-file report, May 1975. 127 p, 1 fig, 5 tab, 3 ref.

Descriptors: *Urban hydrology, *Basic data collections, *Streamflow, *Water quality, *Texas, Hydrologic data, Rainfall-runoff relationships, Storm runoff, Hydrographs, Mass curves.
Identifiers: *San Antonio area(Tex).

This report contains rainfall, runoff, and water-quality data collected during the 1973 water year for the San Antonio metropolitan area. The information will be useful in determining the effects of various stages of urbanization on flood discharge and runoff and in determining chemical constituents in surface-water runoff from floods of various magnitudes during all seasons of the year from areas with different types of utilization. Detailed rainfall-runoff computations, including hydrography and mass curves, are presented for several storm periods during the 1973 water year. Storms producing the highest discharges occurred April 15, 17; June 12, 25; July 16, 17; and September 16, 26-27, 1973. (Woodard-USGS)
W76-03406

U.S. IFYGL SHIPBOARD DATA ACQUISITION SYSTEM,
International Field Year for the Great Lakes Project Office, Rockville, Md.
For primary bibliographic entry see Field 2H.
W76-03416

MATHEMATICAL OPTIMIZATION OF WATER SUPPLY SYSTEMS STATE OF THE ART,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5F.
W76-03441

FLOOD PLAIN INFORMATION: PETERS CREEK, BIRCHWOOD, ALASKA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W76-03454

FLOOD PLAIN INFORMATION: SOUTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento , Calif.
For primary bibliographic entry see Field 4A.
W76-03455

FLOOD PLAIN INFORMATION: WILDCAT CREEK, MANHATTAN, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W76-03456

FLOOD PLAIN INFORMATION: ROARIN BROOK, AVON, CONNECTICUT.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-03457

FLOOD PLAIN INFORMATION: ESCONDID CREEK, SAN DIEGO COUNTY, CALIFORNIA
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-03458

FLOOD PLAIN INFORMATION: RILLIT RIVER AND PANTANO WASH, VICINITY TUCSON, ARIZONA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-03459

FLOOD PLAIN INFORMATION: BIG CREE LOST CREEK, CHRISTIAN CREEK A WHITEMAN'S CREEK, JONESBORO, ARKA SAS.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W76-03460

SPECIAL FLOOD HAZARD INFORMATI REPORT: BEAR CREEK, DENV METROPOLITAN AREA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-03461

FLOOD PLAIN INFORMATION: CACHE POUDRE RIVER, COLORADO, VOLUME GREELEY, WELD COUNTY.
Corps of Engineers, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W76-03462

8. ENGINEERING WORKS

8A. Structures

DESIGN OF STORM SEWER NETWORKS,
Illinois Univ. at Urbana-Champaign. Dept. of Engineering.
For primary bibliographic entry see Field 4A.
W76-03006

THE PLANNING AND CONSTRUCTION POTABLE WATER WORKS IN RELATION THEIR OPERATION (EL PROYECTOR Y STRUCCION DE OBRAS DE AGUA POTA EN RELACION CON LA OPERACION),
For primary bibliographic entry see Field 5F.
W76-03253

DISTRIBUTION SYSTEM OPERATION MAINTENANCE.
For primary bibliographic entry see Field 4A.
W76-03287

ENGINEERING.
For primary bibliographic entry see Field 4A.
W76-03289

CONSTRUCTION.
For primary bibliographic entry see Field 4A.
W76-03291

REPORT ON ENVIRONMENTAL STUDY THOMSON DAM AND ASSOCIATED WOR
Melbourne and Metropolitan Board of (Australia).

primary bibliographic entry see Field 6G.
-03448

Hydraulics

**ECT OF SEPARATION ANGLE ON VOR-
STREETS,**
ham Univ., (England). Dept. of Engineering
nce.
L. Simmons.
nal of the Engineering Mechanics Division,
rican Society of Civil Engineers, Vol 101, No
, Proceedings Paper 11653, p 649-661, Oc-
1975. 7 fig, 1 tab, 17 ref, 2 append.

riptors: *Vortices, *Hydrodynamics, Fluid
anics, Boundary layers, Drag, Hydraulics,
r drag, Shear stress, Base flow, Flow separa-

ifiers: *Blunt bodies, *Wakes, Separation
, Vortex streets, Bluff body, Fluid stability,
ding frequency, Strouhal number,
dynamics.

riments were made at a constant Reynolds
er of 15,000 based on model width to find
the vortex wake of a two-dimensional bluff
was affected by changing the shear layer
ation angle. It was found that while each
could be described using a universal Strou-
mber previously defined in the literature, the
were not similar in the sense of having a
on fixed spacing ratio. It was shown that this
gical consequence of the stability criterion
used both to derive the universal Strouhal
ers and to make predictions of the spacing
s. (Lee-ISWS)
03116

**CTS OF STRUCTURES ON IRREGULAR
ES COMPARED TO REGULAR WAVES,**
Univ., Quebec. Dept. of Civil Engineering.
ellet, and Y. E. Morin.
al of the Waterways, Harbors and Coastal
eering Division, American Society of Civil
eers, Vol 101, No WW3, Proceedings Paper
p 231-246, August 1975. 13 fig, 1 tab, 9 ref, 2
d.

ptors: *Breakwaters, *Coastal engineering,
n waves, *Structures, *Hydraulic models,
(Water), Model studies, Laboratory tests,
ance.
iers: *Spectral analysis, Transfer functions,
g breakwater, Wave energy, Resonant
ncies, Wave action.

tructures, a fixed barrier and an A-shaped
g breakwater, were submitted to the irregu-
ve trains mechanically generated by a pro-
ing device. The effect of structures on
was compared from the simulation of four
of wave spectra. Test conditions for the
res were also made variable by changing
pth of immersion and by varying the
e between the cylinders for the floating
ater. The described tests showed that the
ie of a structure does not show the same in-
on when submitted to attack by regular and
r waves. The use of an irregular wave train
ed detection of the presence of resonant
cies in the system under study more easily.
esonant frequencies were shown to depend
characteristics of the structure. (Singh-

119

**OF MAXIMUM HEIGHT ON UNIFORM
NTS,**
re Univ., Newark. Coll. of Marine Studies;
eware Univ., Newark. Dept. of Civil En-
g.
lrymple, and R. G. Dean.

Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 101, No WW3, Proceedings Paper 11509, p 259-268, August 1975. 6 fig, 1 tab, 11 ref, 2 append.

Descriptors: *Waves(Water), *Boundaries(Surfaces), *Hydraulics, *Laplaces equation, *Water circulation, Free surfaces, Coastal structures, Ocean waves, Coastal engineering, Wavelengths.
Identifiers: *Wave height, *Stream function wave theory, Wave propagation.

Waves in nature, generally, propagate on currents driven by winds, tidal forces, or fravity. For design of offshore structures, it is important to know the maximum height of a wave with a given wave period on a current in water. Waves of maximum height on a uniform current are determined using the stream function wave theory, assuming a symmetric wave propatating ona inviscid and incompressible fluid over a horizontal bottom. The stream function satisfies the Laplace equation throughout the fluid domain, the usual no-flow boundary condition at the bottom, and the dynamic and kinematic free surface boundary conditions. An iterative procedure, which relates a wave propagating on a constant and uniform current to an equivalent wave propagating in still water, has been used to determine the wave of maximum height in the presence of such currents. The effect of the currents is to increase the limiting wave heights when the current flows in the direction of the waves and to increase the percentage of wave crests above still water. The opposite effect is true for opposing currents. (Singh-ISWS)
W76-03120

FEEDBACK FROM FIELD STUDIES OF HYDRAULIC DREDGES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W76-03122

DESIGN OF DRIP IRRIGATION MAIN LINES,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
I-p. Wu.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 101, No IR4, Proceedings paper No 11803, p 265-278, December 1975. 9 fig, 3 tab, 12 equ, 9 ref.

Descriptors: *Irrigation, *Irrigation design, *Irrigation systems, *Energy gradient, Optimization, Computer programs, Cost comparisons, Pipes, Design, Size, Simulation analysis, Dynamic programming, Equations, Evalation, Hazen-Williams equation, Systems analysis.
Identifiers: *Drip irrigation systems, Cost minimization, Pipe design, Papaya field.

A drip irrigation system should be designed to meet water requirements of crops, to possess the capacity to provide extra water during unusually dry period, to distribute water into fields with acceptable uniformity, and to have the lowest cost. The main lines of a drip irrigation system can be designed using a straight energy gradient line. This provides a very simple technique for selecting main line sizes that can be applied especially to evaluate alternative field layouts. An optimal shape of the energy gradient curve is determined as a curve a little bit below the straight energy gradient line. The cost difference between using the straight energy gradient line and the optimal energy gradient line is small, and only around 2%. The developed technique can be used for any kind of topographic condition, uniform or nonuniform, up and down slopes. A straight line energy gradient line can be established when a main line provide is drawn and the available water pressure is determined. The concept can be applied for different types of pipes for sprinkler system design, for water supply pipe systems, or transporting systems for other fluids. (Bell-Cornell)
W76-03160

SECOND-ORDER WAVE FORCE ON LARGE VERTICAL CYLINDER,
Chicago Bridge and Iron Company, Plainfield, Ill. Marine Research and Development.
S. K. Chakrabarti.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 101, No WW3, p 311-317, August 1975. 1 fig, 7 ref, append.

Descriptors: *Waves(Water), *Drag, *Laplaces equation, *Ocean waves, Theoretical analysis, Equations, Coastal engineering, Estuaries, Coastal structures.
Identifiers: *Wave forces, *Nonlinear theory, Velocity potential.

The second-order force included a time-independent component as well as a double-frequency component. The nonlinearity was high even for wave height to depth ratios around 0.1. For larger wave height to depth ratios between 0.2 and 0.25, the second-order theory was found to correlate better with experimental data than did the linear wave theory. The second-order theory generally overpredicted the force. Comparison with other theories was also made. Including the kinematic free surface condition in a highly nonlinear system resulted in a significant alteration of the second-order contribution to the wave force. (Adams-ISWS)
W76-03381

WATER WAVES GENERATED BY LANDSLIDES IN RESERVOIRS,
Engineers Waterways Experiment Station, Vicksburg, Miss. Wave Branch.
For primary bibliographic entry see Field 2H.
W76-03382

LEVEE SYSTEM RELIABILITY ALONG A CONFLUENCE REACH,
Eotovs Lorand Univ., Budapest (Hungary). Dept. of Numerical Methods.
F. Szidarovszky, L. Duckstein, and I. Bogardi.
Journal of the Engineering Mechanics Division, American Soceity of Civil Engineers, Vol 101, No EM5, Proceedings Paper 11621, p 609-622, October 1975. 3 fig, 3 tab, 29 ref, 2 append. NSF GK-35791 and GF-38183.

Descriptors: *Backwater, *Flood control, Hydraulic structures, Levees, Open channel flow, Dikes, Earthworks, Hydrology, Hydraulics, Probability, Simulation analysis, Roughness coefficient, Failures, Reliability, Model studies, Risks.
Identifiers: *Uncertainty principle, *Backwater profiles.

The random stage in the main river and a flood of random stage height in the tributary determine the water level along the levee reach; a nonuniform steady flow equation is used in discretized form to compute backwater curves for each pair of values. Roughness coefficients in the bed and the flood plain are determined by a model calibration procedure. Using this information, the probability of failure in one levee cross section was computed. Another method was developed to calculate the probability of failure of the whole levee system in which a linear regression model yields discretized values of water stage in each levee subreach. Hydrologic, sample, and model uncertainties were examined. The effect of sample uncertainty was shown to increase the probability of failure of the levee. A practical example was used throughout to illustrate the methodology, which may be applied as is to other problems of this type whenever the joint probability distribution can be fitted to a normal or lognormal density function. (Lee-ISWS)
W76-03383

8C. Hydraulic Machinery

FEEDBACK FROM FIELD STUDIES OF HYDRAULIC DREDGES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
D. R. Basco.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 101, No WW3, Proceedings Paper 11526, p 277-289, August 1975. 4 fig, 2 tab, 4 ref, 2 append.

Descriptors: *Dredging, *Harbors, *Hydraulic mining, Instrumentation, Sludge, Effluents, Hydraulic equipment, Model studies, Pipelines, On-site investigations, On-site tests, Excavation.
Identifiers: *Dredges, *Hydraulic dredging, Feedback, Hydraulic excavation, Systems engineering, Hydraulic pipelines, Total volume flow, Mass density, Density meter.

Hydraulic dredging is an extremely complicated process and much is unknown and remains to be discovered about its nature. Soil, operation, and other considerations vary considerably; therefore, actual on-the-job field dredging projects must be employed to gather information and overcome these gaps in dredging knowledge. Methods and equipment were examined for use in overcoming those obstacles that inhibit or eliminate the feedback of information from real dredging situations. It was concluded that feedback from day-to-day dredging projects is fundamental, lacking, or nonexistant, and one of the biggest problems facing the industry in 1975. These problems were not considered insurmountable. (Roberts-ISWS)
W76-03122

EXCAVATOR AND PUMPS CONQUER WATER TABLE.
Roads and Streets, Vol 118, No 10, p 96, 98, October, 1975.

Descriptors: *Sewers, *Sewerage, *Dewatering, *Construction, Pumping, Wells, Equipment, Costs, Joints(Connection), Indiana, Water table, *Pumps.
Identifiers: Trenches, Sewer excavation.

A 20,000 ft network of deep sewer trenches was dug for a $6 million interceptor sewer system in Whiting, Indiana. The route of the system, which will handle both storm water and sewerage, was within 1000 ft of the shoreline of Lake Michigan. Because the trench was dug from 20 to 30 ft deep in a layer of fine silty sand loaded with organic materials, dewatering was a difficult process. To facilitate dewatering, deep wells were installed and pumping was done two months prior to excavation. Dewatering costs were about $300,000, and the process eliminated the need for putting down sheeting or distrubing traffic in the city's business district. A 4 1/2 cu yd hydraulic excavator with a steel trench box was used for excavation after the water table had been lowered. As each pipe section was positioned, it was fitted with a round steel plate to prevent inflow of sand or water. The plate was removed and reused for each new section. Each bell joint was coated with a non-shrink plastic sealing compound. The process cost $200 per day, but the cost was more than saved in cleanup expenses when the pipe was later inspected. (Kramer-FIRL)
W76-03196

WIDE RANGE OF EQUIPMENT FOR SEWAGE DISPOSAL.
Water Services, Vol 79, No 954, p 335-336, August, 1975.

Descriptors: *Waste water treatment, *Sewerage, *Equipment, *Pumps, *Valves, Centrifugal pumps, Hydraulic equipment, Hydraulic valves, Flow control, Penstocks.
Identifiers: York(Great Britain).

Adams-Hydraulics Limited of York (Great Britain) has been manufacturing pumps and valves for sewage disposal, water pollution control, and industrial processing since 1885. The Amphistoma centrifugal sewage pump is available in a wide range of capacities up to 250 liters/sec and for maximum head limits of about 35 meters. The principal types are the vertical dry well type and horizontal patterns including portables. Compressed air actuated sewage or sludge ejector pumping units are also available. The ejector can be installed in a below ground level chamber while the compressor is placed in a nearby building since the only connection between the compressor and ejector is a small bore steel air pressure pipe. The company will supply the pumps only or will complete the total installation including all the pipework with sluice and reflux valves, all electrical equipment, erection, wiring and painting. Many designs of valves are offered by the firm including: flap valves for river and sea outlets; penstock valves for water and sewage from 80 mm up to 1800 mm diameter; a range of floating arm draw-offs; decanting valves and search arms; sludge plug valves; and relief valves. The Module valve unit is an automatic device used to limit maximum discharge especially from storm water, trade wastes, and water run-off from motorways. Appointments may be made to see the firm's wide range of products being manufactured at York. (Orr-FIRL)
W76-03213

PLASTIC PUMP HANDLES ACID USED IN WATER SYSTEM.
Water and Sewage Works, Vol 122, No 9 p 106 September, 1975.

Descriptors: *Water treatment, *Pumps, *Centrifugal pumps, *Plastics, Acids, *Electrodialysis, Membrane processes, Maintenance costs, Installation, *Treatment facilities, Florida.

The world's second largest electrodialysis water treatment system for the island of Siesta Key, west of Sarasota, Florida, is described. Its special feature is a single, all-plastic centrifugal pump, which handles the hydrochloric acid, caustic soda, and other chemicals needed in the system. The electrodialysis process involves the flushing of impure well water through stacks made up of nearly 24,000 membranes charged with either negative or positive ions. During treatment, slime or sludge builds up in the membranes, and is removed by introducing acids into the water and mixing the solution. By using the Chem-Gard heavy duty plastic horizontal centrigugal pump for mixing, both the time needed to flush the membranes and the costs of maintenance are reduced. The pump was installed at a central location, and handles over 250 gal per minute. Pipes run to the membranes, and a series of valves permits the pump to mix solutions at any of the membranes by the opening or closing of selected valves. The pump unit isolates all metal components (including the stainless steel shaft) from contact with the acid fluid being handled. The centrifugal pump has been operating for over a year, in continual on/off operation and has had no failures or parts replacement. Because the pump is mounted in a stationary position on a pedestal, the flushing time has been reduced, and no water treatment stoppages due to pump failure have been reported. (Kramer-FIRL)
W76-03217

CIRCULAR TANK SCRAPER.
Effluent and Water Treatment Journal, Vol 15, No 8, p 431, August, 1975. 1 fig.

Descriptors: *Equipment, *Sludge disposal, Engineering, *Tanks, Wind velocity, Scum, Maintenance.
Identifiers: *Scanwater Equipment Limited, *Scanscraper.

Scanwater Equipment Limited now produces new scraper for circular and secondary tank known as the Scanscraper. The Scanscraper u has many adaptable features which suit it to a application. These include: scum blade suppo which may be adjusted to allow for the prevaili winds; the scum box which can be sized to speci cally suit the tank's diameter; the diffuser dr sized to suit tank dimensions and adjustable height; and, fully adjustable weir plates. The sc scraper's bridge is offered in aluminum or ste and tests revealed that it adheres more strongly the tank wall as prevailing winds increase in int sity. The Scanscraper carries a guarantee of a sales service performed by qualified engine (Beale-FIRL)
W76-03222

COMPARATIVE RIST-COST-BENEFIT STU OF ALTERNATIVE SOURCES OF ELECT CAL ENERGY. APPENDIX A: ENERGY EXPE DITURES ASSOCIATED WITH ELECTI POWER PRODUCTION BY NUCLEAR A FOSSIL FUELED POWER PLANTS.
Division of Reactor Research and Developm (USERDA), Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-03281

COLORADO RIVER AQUEDUCT OPERATI AND MAINTENANCE.
For primary bibliographic entry see Field 4A.
W76-03286

ASPECTS OF WATERWORKS PUMP PLANT DESIGN,
G. N. Sharma.
Journal of the Institution of Water Engineers Scientists, Vol 29, No 3, p 148-154, May, 19 tab.

Descriptors: *Pumps, *Operating costs, *Ca costs, Economics, Hydraulics, Design crit Hydraulic equipment.
Identifiers: Rotodynamic pumps.

Design problems for Rotodynamic pumps discussed. Hydraulic and electrical considera vary, according to the pump type and its spe speed. Operating costs of an installation fa ceed initial plant cost and the pump peak effi cy margin is not widespread. Specific cases paring the performance and annual running (ARC) of typical pumps were illustrated, base 8750 hours at 0.70 per KW. In an example, submersible pump installed in a borehole h capital cost of L1625, an efficiency of 65.2%, input of 62.4, and an ARC of L3820, whi counterpart, with a capital cost of L2000 had ficiency of 68.5%, KW input of 59.5, and a ARC (L3640). Therefore, while the initial c cost of the first model was higher by 375 poun showed an annual savings of 180 pounds would be cheaper by its third year of operati study comparing two horizontal spindle type face pumps showed a less dramatic annual sa in operating costs and a longer period for cost recovery. However, a pump arrange using a submersible borehole type and a su type in series might prove to be econo Financial gain in operating costs is also depe on the percentage of total head that the mor cient surface pump is required to gen (Kramer-FIRL)
W76-03324

DEVELOPMENTS IN PUMPING SYSTE TWO YEARLY REVIEW, PUMPING AND EMPINGHAM SCHEME.
Water and Waste Treatment, Vol 18, No 8, 19, August, 1975. 3 fig.

Descriptors: *Water supply, *Reser *Pumping, *Pumps, Equipment, Rivers, ment facilities, Water treatment, Aqueducts.

ntifiers: Pump storage, Northampton(Great tain).

e largest man-made reservoir in Great Britain is ler construction near the village of Empingham. en completed, it will hold 27,300 million gallons water, and provide a reliable supply of 50 mgd. cause the area is one of very low residual rain-, a pump storage project must be implemented. sources of water supply available are the ers Welland and Nene, which have wide flow variations. In order to take advantage of high v rates when they occur, a pumping plant with tal capacity of 193 mgd has been installed. An educt 13 miles long was also constructed, ch leads from the reservoir to the farthest in-. As the aqueduct crosses the valleys of the ie and Welland Rivers, the intervening ersheds are connected by means of pumping ns and tunnels. The final tunnel section ter-ates in two 33 ft diameter shafts at the foot of a . These shafts have been designed to ac-odate 12 shaft drive borehole pumpsets. A ping station has also been built at the foot of dam on the side adjacent to the abstraction ts to boost raw ater at a rate of 36 mgd to a tment works at Wing. This treatment facility, rated by the Northhampton Water Division, be equipped with two vertical Uniglide sets iable speed pumps) which may operated under ing head and quantity conditions, depending the output required. (Kramer-FIRL)
-03340

OF JET PUMPS IN MARINE WASTE POSAL,
nion - Israel Inst. of Tech., Haifa.
primary bibliographic entry see Field 5E.
-03379

Concrete

ITING RESTORES A SEWER,
saddle-Garber, Marshalltown, Iowa.
Garber.
American City and County, Vol 90, No 10, p October, 1975.

riptors: *Gunite, *Sewers, *Runoff, Costs, iring, Concrete, Cleaning, Rainfall, Flow , Cleaning.

n a Tama, Iowa, storm sewer was severely ged by heavy rainfall, complete replacement not financially possible. Instead, it was de- to repair the system and increase the flow of ff water. The rubble masonry walls of the r were cleaned, concrete roof slab was ored to the walls, voids were filled with rete grout, and weak spots were repaired. surfaces were then smoothed by spraying gu-ver wire mesh. The gunite seal, a mixture of nt, sand, and water, will be effective for al years. The restoration cost $34,000, or 0 less than the orginial contract estimate. The ct was financed by road-tax money. (Kramer-)
03193

RGENCY REPAIR OF CRACKED HOLD-TANK,
s State Univ., Normal. Coll. of Applied ce and Technology.
Jacobson.
Works, Vol 106, No 10, p 114, October,

iptors: *Waste water treatment, *Activated , *Tanks, Concrete, Repairing, Construc-aterials, Maintenance, Pennsylvania.
fiers: *Mari-Crete, Holding tanks.

gency measures were undertaken to repair a d excess sludge holding tank at a resort area waste water treatment plant at Lake Wallenpaupack, Pennsylvania. The plant was of the extended aeration activated sludge type and had an excess sludge holding tank which is emptied by tank truck periodically. During a routine maintenance check, the tank was found to have cracked at a point about four feet from the top. A concrete material, Exide Mari-Crete, was applied as a repair product and successfully sealed the tank crack without requiring a primer. The material is obtained as a dry product and is mixed with water to a putty-like consistency. Mari-Crete possesses a 24-hour compressive strength of 3100 psi and a 24-hour tensile strength of about 280 psi under humid conditions, and higher under dry conditions. After application of the repair product, a protective coating of asphalt was applied and the tank was returned to operation. (Kramer-FIRL)
W76-03209

8G. Materials

CONTINUED STUDIES ON THE USE OF A MIXED CHROMATE-PHOSPHATE INHIBITOR IN DESALINATION SERVICE: PART TWO,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 3A.
W76-03143

DEVELOPMENT, FABRICATION AND TESTING OF A PPB COPPER ANALYZER,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 3A.
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SEA WATER CORROSION TEST PROGRAM: PART THREE,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 3A.
W76-03145

SEA WATER CORROSION TEST PROGRAM: PART FOUR,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 3A.
W76-03146

OPTIMUM SIZE OF EQUIPMENT,
Construction Estimating, Inc., West Hartford, Conn.
M. Gates, and A. Scarpa.
Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, Vol 101, No CO4, Proceedings paper No. 11772, p 861-867, December 1975. 3 fig, 17 equ, 1 ref.

Descriptors: *Construction, *Construction equipment, *Value engineering, *Estimating, *Economics, *Pipelines, Planning, Size, Optimization, Linear programming, Design, Costs, Equations, Sewers, Culverts, Systems analysis.
Identifiers: *Cost minimization, Buckhoes, Capacity, Trench excavation, Pipe laying.

Generally speaking, equipment of greater capacity yields lower unit costs than does equipment of lesser capacity. However, this is not true when the equipment is employed in an operation consisting of at least one activity that is independent of, and at least one other activity that is dependent on, the size or capacity of the equipment relative to combined output. In this case, there exists an optimum size or capacity of the equipment that yields the minimum total unit cost for the combined independent and dependent activities. These relationships are explored herein and the equation for finding the optimum size or capacity of the equipment is derived. An example gives the economical size of the backhoe used both to excavate the trench and lay the pipe for a storm sewer pipe culvert. (Bell-Cornell)
W76-03161

CONTINUED STUDIES ON THE USE OF A MIXED CHROMATE-PHOSPHATE INHIBITOR IN DESALINATION SERVICE, FINAL REPORT,
Dow Chemical Co., Midland, Mich.
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Dow Chemical Co., Midland, Mich.
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ECONOMIC ANALYSIS OF THE INLAND FISHERIES PROJECT IN EL SALVADOR,
Auburn Univ., Ala. International Center for Aquaculture.
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MATHEMATICAL OPTIMIZATION OF WATER SUPPLY SYSTEMS STATE OF THE ART,
Michigan Univ., Ann Arbor. School of Public Health.
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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 9, NUMBER 8
APRIL 15, 1976

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ary of the U.S. Department of the Interior has de-
at the publication of this periodical is necessary in the
of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

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FOREWORD

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rovide WRSIC with input, selected organizations with e water resources research programs are supported as ers of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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w Hampshire Univ., Durham. Inst. of Natural l Environmental Resources.
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INFALL-RUNOFF RELATION FOR DWOOD CREEK ABOVE ORICK, CALIFOR-A,
ological Survey, Menlo Park, Calif.
W. Lee, G. W. Kapple, and D. R. Dawdy.
en-file report, November 1975. 14 p, 1 fig, 4 4 ref.

scriptors: *Rainfall-runoff relationships, odel studies, *Lumbering, *California, eline studies, Vegetation effects, Clear-ing, Environmental effects, Runoff, Storms, nputer models.
ntifiers: *Redwood Creek(Calif).

A digital computer was used to calibrate a model for synthesizing daily runoff for two periods, one in the late 1950's before intensive logging began and another in the late 1960's and early 1970's after intensive logging had been started, in the Redwood Creek basin on the northern California coast. The calibrated models were used with the daily rainfall records for these two periods to provide estimates of synthetic daily runoff records. The storm season runoff is about 20 percent greater than would be expected for the period before the beginning of intensive logging. (Woodard-USGS)
W76-03903

HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.
D. L. Sturges.
USDA Forest Service Research Paper RM-140, March 1975. 23 p, 18 fig, 4 tab, 41 ref.

Descriptors: *Sagebrush, *Watershed management, *Range management, *Water yield, *Sediment discharge, Surface runoff, *Streamflow, *Snow management, Snowdrifts, Plant-water-soil relationships, Vegetation effects, Water yield improvement, Suspended load, Snowmelt, Hydrographs.
Identifiers: *Big sagebrush, *Oversnow flow.

The purpose of the paper is to guide hydrologists and land managers by providing information on (1) what is known about the hydrology of big sagebrush lands, and (2) how this knowledge can be effectively used in reaching management decisions. Three subspecies comprise the big sagebrush complex and each is indicative of important environmental factors. Big sagebrush lands receive about 8 to 20 inches of precipitation annually and one-half to two-thirds of the total falls as snow. Lands in higher precipitation regions of the type are the source of perennial streamflow. The climate, vegetation, snow accumulation, and water yield characteristics for big sagebrush lands are described. The influence of land management practices on vegetative composition and the hydrologic regime is outlined in detail. Potential hydrologic benefits from managing blowing snow in the big sagebrush zone is highlighted as well as additional research needs. (Forest Service)
W76-03967

2B. Precipitation

SOLAR HEATING TO PREVENT FREEZING IN RECORDING RAINGAUGES,
Lincoln Coll. (New Zealand). Tussock Grasslands and Mountain Lands Inst.
R. P. Stratford, and E. J. Costello.
Journal of Hydrology (New Zealand), Vol 13, No 2, p 139-141, 1974. 2 fig.

Descriptors: *Rain gages, *Solar radiation, *Freezing, Altitude, Meteorology, Heating.
Identifiers: *New Zealand.

A method was described to heat and prevent freezing of meteorological instruments at high altitudes in New Zealand. The specific instrument for which the proposed heating arrangement was utilized was the Lambrecht Automatic Siphoning raingage. The mechanism consisted of solar heating panels with necessary network of pipes. The design features of the heating arrangements were described with supporting figures. (Bhowmik-ISWS)
W76-03857

A LATE HOLOCENE POLLEN DIAGRAM FROM NEAR LAKE TAHOE, EL DORADO COUNTY, CALIFORNIA,
Slovenska Akademija Znanosti in Umetnosti, Ljublijana (Yugoslavia); and Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2I.
W76-03897

2C. Snow, Ice, and Frost

SNOWMELT RUNOFF EFFICIENCIES ON ARIZONA WATERSHEDS,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
For primary bibliographic entry see Field 3B.
W76-03581

CONTRIBUTIONS TO THE CHEMISTRY OF ANTARCTIC SNOW: DETERMINATION OF TRACE ELEMENTS AT THE PPB LEVEL BY ATOMIC ABSORPTION SPECTROMETRY,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
C. Boutron.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA 007 112, Price $5.00 in paper copy, $2.25 in microfiche. United States Army CRREL Draft Translation 424, January 1975. 80 p, 5 fig, 5 tab, 54 ref. Translated from Glaciology Laboratory, National Council for Scientific Research, Publication No. 138, May 10, 1971.

Descriptors: *Snow, *Polar regions, *Chemical analysis, *Trace elements, *Analytical techniques, *Antarctic, Meteorology, Precipitation(Atmospheric), Snow cover, Analysis, Snow surveys, Neutron activation analysis, Instrumentation, Spectroscopy, Water chemistry, Sampling, Chlorine, Geochemistry.
Identifiers: *Snow impurities, *Snow chemistry, *Trace minerals, Polar snow, Atomic absorption spectrometry, Sample preparation, Fallout table, Analytical problem.

The composition of the impurities contained in Antarctic snow has yet to be established. The published values have undergone repeated major revisions, and the concentration levels for a good many elements have yet to be determined. This work was based primarily on the study of geographical variations and on the establishment of a fallout table, backed up by some observations as to the identification of the various possible origins. Analysis by atomic absorption spectrometry of the elements sodium, magnesium, calcium, potassium, and iron was performed as well as analysis by neutron activation of the elements chlorine, sodium, and manganese. The element most abundant in Antarctic snows is chlorine, found in concentrations on the order of 10 to the minus 7th power g/g of snow; most of the other elements are found in proportions below 10 to the minus 9th power g/g snow. Measuring such small concentrations presents special problems concerning sampling procedures on the ground and sample preparation, as well as with analytical techniques. (See also W76-03729) (Henley-ISWS)
W76-03728

CONTRIBUTION TO THE CHEMISTRY OF ANTARCTIC SNOW: TRACE ELEMENT DOSAGE BY NEUTRON ACTIVATION,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
M. Echevin.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA 007 106, Price $5.00 in paper copy, $2.25 in microfiche. United States Army CRREL Draft Translation 423, November 1974. 80 p, 6 fig, 6 tab, 42 ref, 1 append. Translated from Glaciology Laboratory, Na-

tional Council for Scientific Research, Publication No. 139, May 10, 1971.

Descriptors: *Snow, *Polar regions, *Chemical analysis, *Trace elements, *Analytical techniques, *Antarctic, Meteorology, Precipitation(Atmospheric), Snow cover, Analysis, Snow surveys, Neutron activation analysis, Instrumentation, Spectroscopy, Water chemistry, Sampling, Chlorine, Geochemistry.
Identifiers: *Snow impurities, *Trace minerals, Polar snow, Atomic absorption spectrometry, Sample preparation, Snow composition, Chlorinity.

A program of studies on impurities found in the polar snows, centering primarily on the Antarctic, was described. The program was conducted along two avenues: (1) spectrometric analysis of the atomic absorption of the elements, sodium, magnesium, calcium, potassium, manganese, and iron; and (2) neutron actuation analysis of the elements, chlorine, sodium, and manganese. In order to obtain the largest possible quantity of data, these two studies were run in very close collaboration and both bear on the analysis of the same samples. The most abundant element in the Antarctic snows was chlorine, present in concentrations on the order of 10 to the minus 9th power g/g of snow; most of the other elements were found in concentrations below 0.010 g/g of snow. (See also W76-03728) (Henley-ISWS)
W76-03729

APPLICATIONS OF ERTS IMAGERY TO SNOW AND GLACIER HYDROLOGY,
Geological Survey, Tacoma, Wash.
M. F. Meier.
Reprint from Proceedings of Symposium on Approaches to Earth Survey Problems through Use of Space Techniques, held in Constance, Germany, May 23-25, 1973: Committee on Space Research (of the International Council of Scientific Unions) COSPAR, p 329-334, 1974. 6 figs.

Descriptors: *Hydrology, *Snow cover, *Glaciers, *Remote sensing, *Satellites(Artificial), River basins, Washington, Snow, Water equivalent, Aerial photography, Hydrologic data, Meteorological data.
Identifiers: *ERTS imagery, *Thunder Creek basin(Wash).

The percentage of snowcovered area on specific drainage basins was measured from ERTS imagery by video density slicing using the Stanford Research Institute Electronic Satellite Image Analysis Console (ESIAC). Results were repeatable to 4% of the snow-covered area. Data from ERTS images of the melt season snowcover in the Thunder Creek drainage basin in the North Cascades, Washington were combined with existing hydrological and meteorological observations to enable calculation of the time distribution of the water stored in this mountain snowpack. Similar data could be used for frequent updating of expected inflow to reservoirs. Equivalent snowline altitudes were determined from area measurements. Variations in snowline altitudes were determined by combining enlarged ERTS images with maps; an accuracy of about 60 miles was attained under favorable conditions. ERTS imagery was also used to measure glacier accumulation area ratios, detect subtle flow structures on glaciers, identify surging glaciers and monitor changes in tidal glacier termini. (Woodard-USGS)
W76-03902

2D. Evaporation and Transpiration

CONTROLLING EVAPORATION OF WATER,
Nalco Chemical Co., Chicago, Ill. (Assignee).
For primary bibliographic entry see Field 3B.
W76-03506

A SIMPLER EMPIRICAL EXPRESSION FOR ACTUAL EVAPOTRANSPIRATION RATES: A DISCUSSION,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
E. T. Linacre.
Agric Meteorol. Vol 11, No 3, p 451-452, 1973, Illus.

Descriptors: *Evapotranspiration, Evaporation, Soil moisture.

Data obtained in various conditions were collated to yield the following empirical relationship: EA = 0.732 - 0.050 (PE) + (4.97 (PE) - 0.661 (PE)2)MR - (8.57 (PE) - 1.56 (PE)2)MR2 + (4.35 (PE) - 0.880 (PE)2)MR3 mm/day where Ea is the actual measured evaporation rate of soil containing a fraction MR of the available water capacity, in conditions where the potential evaporation rate (of a fully wet surface) is PE mm/day. The actual evaporation rate equals whichever is the less of: the potential evaporation rate; or 16 (MR)2 mm/day, where MR is the proportion present of the available water capacity of the soil. This may be sufficiently accurate for irrigation agriculture, for instance.--Copyright 1974, Biological Abstracts, Inc.
W76-03521

FIELD STUDY OF EVAPORATION--CATALOGUE OF DATA FOR PHASE I,
Bureau of Meteorology, Melbourne (Australia). Dept. of Science.
R. D. Hoy, and S. K. Stephens.
Australian Water Resources Council Technical Paper No. 11, 1975. 51 p, 5 fig, 13 tab, 6 ref, 2 append.

Descriptors: *Evaporation, *Australia, *Data collections, *Data storage and retrieval, Rain, Water resources, Temperature, Meteorological data, Winds, Humidity, Lakes, Water shortage, Inflow, Water storage, Instrumentation, Measurement, On-site data collections, Information retrieval.
Identifiers: *Measuring evaporation, *Lake Mundaring(Australia), *Lake Manton(Australia), *Lake Cateract(Australia), *Lake Eucumbene(Australia).

The paper described meteorological and hydrological data collected and the data archive for the four lakes in Phase 1 of the Australian Water Resources Council Research Project 68/5--Field Study of Evaporation. Three lakes were selected for the data collection project: Mundaring near Perth, Manton near Darwin, and Cateract near Sydney. After commencement of the study, it was decided to include similar data collected during 1962-1964 by the Snowy Mountains Hydro-electric Authority from Lake Eucumbene in New South Wales for archiving, computation, and analysis. Details on the availability and reliability of the data, and on computer procedures used by the Bureau of Meteorology in Melbourne to edit and archive the data from the four lakes, were given. An indication of the vast quantity of continuous and reliable data in the archive was given, and information was provided for scientists and engineers on the procedure to retrieve data. Two other volumes have been published on the study, as Technical Papers Nos. 1 and 2 in the same series. These described the installation, operation and maintenance of equipment, and the extraction and computation of the data. (Roberts-ISWS)
W76-03724

2E. Streamflow and Runoff

FLOOD HAZARDS ALONG THE BALCONES ESCARPMENT IN CENTRAL TEXAS--ALTERNATIVE APPROACHES TO THEIR RECOGNITION, MAPPING, AND MANAGEMENT,
Texas Univ. at Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 4A.
W76-03723

OCEANIC VELOCITY GRADIENTS,
Texas A and M Univ., College Station. Dept. o
Oceanography.
For primary bibliographic entry see Field 2L.
W76-03736

OUTPUT FROM A CASCADE OF DISCRET LINEAR RESERVOIRS WITH STOCHASTI INPUT,
Department of Environment, Ottawa (Ontario Hydrology Research Div.
V. Klemes, and L. Boruvka.
Journal of Hydrology, Vol 27, No 1/2, p 1-13, O tober 1975. 4 ref, append.

Descriptors: *Reservoirs, *Stochastic processe *Statistical methods, *Mathematic *Mathematical studies, *Systems analysi Analytical techniques, Storage, Flow, Probabilit Discharge(Water), Inflow.
Identifiers: *Linear reservoirs, *Marginal distrib tions, *Autoregressive input, Probability densi function, Cascade output.

A mathematical description was given of the o put resulting from a stochastic input to a casca of linear reservoirs. The input process was co sidered an auto regressive type with a continuo marginal probability density function. First, t stochastic structure of a cascade output from random input was investigated. The dependence output from a reservoir on outputs from all the stream reservoirs was transformed into a dep dence on the past outputs from the reservoir un conderation. For identical upstream reservo the expression for this dependence became qu simple. The expression was generalized for so reservoirs being dissimilar. Finally, the probabi density function of output from a cascade of lin reservoirs fed by an upstream autoregressive in of a given order was derived. (Singh-ISWS)
W76-03742

MEASURING WATER VELOCITY BY TRASONIC FLOWMETER,
Bureau of Reclamation, Denver, Colo. Hydrau Branch.
For primary bibliographic entry see Field 8B.
W76-03749

THE RIVER THAMES FLOOD DEFENCE B RIER,
Great London Council, (England), Dept. of Pu Health Engineering.
For primary bibliographic entry see Field 4A.
W76-03800

STREAM CHANNEL MEASUREMENTS NEW ZEALAND,
Victoria Univ., Wellington (New Zealand). I of Geography.
For primary bibliographic entry see Field 7A.
W76-03856

APPENDIX 2, SURFACE WATER HYDR GY, GREAT LAKES BASIN FRAMEW STUDY.
Great Lakes Basin Commission, Ann A Michigan, Public Information Office.
1975. 133 p, 94 fig, 9 tab, 75 ref.

Descriptors: *Great Lakes Region, *Hydr data, *Surface waters, *Great Lakes, *Su water availability, *Surface runoff, Ru Streamflow, Floods, Flood data, Flood frequ Flow duration, Frequency ana Discharge(Water), Discharge frequency, Dat lections, Hydrology, Low flow, Low frequency, Droughts, Reservoir sites, Re analysis, Water supply.

This appendix provides a generalized evaluat surface water runoff entering the five Great

rom tributary streams in the United States. Of the 98,000 sq mi in the Great Lakes Basin, 115,000 sq ni are in the United States and 88,000 sq mi lie in anada. No new basic data were gathered for this ppendix. Surface water data presented included unoff analysis, flood characteristics, drought ows, surface water availability and reservoir tes. Average monthly runoff as well as maximum nd minimum monthly runoff values were resented for 143 stations. Maximum flow and age as well as 2, 50 and 100 year discharges were resented for 187 stations. Generalized peak equency curves were also presented. For 154 tes instantaneous, 1-day and 7-day recorded low ows as well as expected 1-day, 30 year, and 7-ay, 10 year low flows were presented. Cumula-ve mass curves of runoff were presented for 15 ibareas, and 672 reservoir sites with surface eas greater than 500 acres were documented. erstriep-ISWS)
76-03862

PPENDIX 11, LEVELS AND FLOWS, GREAT AKES BASIN FRAMEWORK STUDY.
reat Lakes Basin Commission, Ann Arbor, ichigan, Public Information Office.
r primary bibliographic entry see Field 4A.
76-03865

PPENDIX 14, FLOOD PLAINS, GREAT AKES BASIN FRAMEWORK STUDY.
reat Lakes Basin Commission, Ann Arbor, ichigan, Public Information Office.
r primary bibliographic entry see Field 4A.
76-03867

EGIONAL SKEW IN SEARCH OF A PARENT,
ological Survey, Reston, Va.
C. Matalas, J. R. Slack, and J. R. Wallis.
ater Resources Research, Vol 11, No 6, p 815-5, December 1975. 10 fig, 11 tab, 7 ref.

scriptors: *Flood frequency, *Forecasting, egional analysis, *United States, *Regression alysis, Correlation analysis, Methodology, alytical techniques, Historic floods, Evalua-n.
ntifiers: *Coefficient of skewness, Historical od sequence, Mean-standard deviation relation-p.

roblem of continuing interest in flood frequen-analysis is that of obtaining a reliable estimate the coefficient of skewness for a historical od sequence. To compare historical estimates he coefficient of skewness with those derived m Monte Carlo experiments, historical flood ords at 1351 stream-gaging stations were used. historical records, a sample from the nearly 00 stream-gaging stations in the United States, e considered to be of good quality, the effects regulation and diversion being minimal. The tionship between the mean and the standard iation of regional estimates of skewness for orical flood sequences is not compatible with relations derived from several well-known dis-ution functions. (Woodard-USGS)
6-03899

ATISTICAL SUMMARIES OF STREAM-OW RECORDS, OKLAHOMA, THROUGH 4,
logical Survey, Oklahoma City, Okla.
primary bibliographic entry see Field 7C.
6-03904

DROLOGIC UNIT MAP--1974, STATE OF ZONA.
logical Survey, Reston, Va.
primary bibliographic entry see Field 7C.
6-03909

HYDROLOGIC UNIT MAP--1974, STATE OF CALIFORNIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-03910

DRAINAGE AREAS FOR ILLINOIS STREAMS,
Geological Survey, Champaign, Ill.
For primary bibliographic entry see Field 7C.
W76-03913

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.
For primary bibliographic entry see Field 4D.
W76-03965

HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.
For primary bibliographic entry see Field 2A.
W76-03967

2F. Groundwater

A PRELIMINARY REPORT ON ANOMALOUS PRESSURES IN DEEP ARTESIAN AQUIFERS IN SOUTHEASTERN NORTH CAROLINA,
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Resources Planning and Evaluation.
For primary bibliographic entry see Field 4B.
W76-03526

UNSTEADY UNCONFINED FLOW INTO A SURFACE RESERVOIR,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Journal of Hydrology, Vol 27, No 1/2, p 95-110, October 1975. 5 fig, 2 tab, 5 ref.

Descriptors: *Groundwater, *Surface-groundwater relationships, *Groundwater movement, *Groundwater barriers, Water table aquifers, Porosity, Transmissivity, Compressibility, Reservoirs, Surface waters, Unsteady flow, Streams, Boundaries(Surfaces), Water table, Equations, Flow.
Identifiers: Delayed drainaged, Elastic aquifers.

The flow in a vertical plane of a semi-infinite unconfined aquifer into or from a reservoir was considered. The aquifer, the initial state of which is one of uniform head distribution, was subjected to an instantaneous change of the water level at the boundary. Elastic reaction of the aquifer and concomitantly occurring variable vertical movement of flow were taken into account in a response mechanism of the unconfined formation to the water-boundary disturbance. The average drawdown equation and the free surface drawdown equation for flow in a compressible unconfined aquifer were derived. The solutions were presented in a tabulated form and a set of type curves were prepared. (Gibb-ISWS)
W76-03744

LIMESTONE DRAINAGE SYSTEMS,
Birmingham Univ. (England). Dept. of Geography.
D. P. Ede.
Journal of Hydrology, Vol 27, No 3/4, p 297-318, December 1975. 8 fig, 6 tab, 16 ref.

Descriptors: *Limestones, *Drainage systems, *Groundwater movement, *Drainage patterns(Geologic), *Water quality, Sinks, Fracturs(Geologic), Karst hydrology, Aquifers, Springs, Spring waters, Water types, Carbonate rocks, Water properties, Hardness(Water).
Identifiers: South Wales, *Resurgence flow, Conduit flow, Sinking streams, Flow networks.

The form of a number of limestone drainage systems on the Gower Peninsula, South Wales, was described. The effect of system morphology on seasonal variation in flow pattern and solute load at spring sites was examined and the systems ordered according to the degree of development of the conduit flow component and the integration of percolation inputs. Reference was made to the development of flow systems in other areas. A projection of the effect of system form on the discharge hydrograph was attempted. Reference was made not only to chemical characteristics but also to mode of operation and systems definition. (Prickett-ISWS)
W76-03747

RESPONSE TESTING OF PIEZOMETERS IN FRACTURED POROUS MEDIA,
Alberta Univ., Edmonton. Dept. of Geology.
F. W. Schwartz.
Canadian Geotechnical Journal, Vol 12, No 3, p 408-412, August 1975. 2 fig, 1 tab, 6 ref.

Descriptors: *Piezometers, *Testing, *Water levels, *Canada, Fractures(Geologic), Porosity, Bedrock, Hydraulic conductivity, On-site data collections, Artesian heads, Pressure, Graphical analysis, Curves, Wells, Volume, Porous media, Equilibrium.
Identifiers: *Slug test, *Alberta(Canada), Empirical method.

Conventional methods of piezometer response testing were unsuitable for analyzing observed data from three piezometers placed in fractured coal and siltstone units. However, these responses corresponded closely to the results of pressure tests in fractured limestones (Pollard). Following an extended form of the Pollard analysis, the fracture porosity within fractured coal units was calculated to comprise approximately 3.7% of the total porosity. In the deeper siltstone unit, the fracture porosity made up only 0.5% of the total porosity. The application of basic time lag principles (Hvorslev) to separate segments of the Pollard plot made it possible to determine the hydraulic conductivity of the matrix and fracture systems. The hydraulic conductivity of the fracture system was calcuated to be 40 to 250 times higher than the matrix. (Viscocky-ISWS)
W76-03751

UNDERGROUND WATERS OF THE LOWER HUTT--A MODEL STUDY,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Physics and Engineering Lab.
I. G. Donaldson.
Journal of Hydrology (New Zealand), Vol 13, No 2, p 81-97, 1974. 4 fig, 17 ref.

Descriptors: *Computer models, *Groundwater, *Aquifer systems, *Groundwater basins, Digital computers, Recharge, Models tudies, Simulation analysis, Unconsolidated aquifers, Water levels, Withdrawal, Surface-groundwater relationships, Aquifers, Water management(Applied).
Identifiers: *Finite difference theory, *New Zeland, *Lower Hutt Valley(New Zealand).

A two-dimensional time-dependent computer-based model of the Lower Hutt - Port Nicholson groundwater system has been developed and was described briefly. The model was designed both as a resource and as a management tool in that it has the potential of simulation of the groundwater system under real operating conditions as well as of prediction of drawdown effects under sustained withdrawal conditions of any type likely to be expected in practice. Computer heads throughout the

field over a seven-week period were illustrated and showed the quality of the model as a tool in groundwater behavior simulation. (Sanderson-ISWS)
W76-03753

THE FUTURE OF WATER RESOURCES IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6D.
W76-03755

GROUND-WATER RECHARGE SIMULATION,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 4B.
W76-03801

THE EFFECT OF SANITARY LANDFILLS ON WATER QUALITY IN SOUTHERN INDIANA,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-03851

APPENDIX 3, GEOLOGY AND GROUND WATER, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan , Public Information Office.
1975. 152 p, 60 fig, 15 tab, 244 ref.

Descriptors: *Great Lakes Region, *Geology, *Groundwater, *Aquifers, *Illinois, *Indiana, *Michigan, *Minnesota, *New York, *Ohio, *Pennsylvania, *Wisconsin, *Lake Superior, *Lake Michigan, *Lake Huron, *Lake Erie, *Lake Ontario, Hydrogeology, Hydrology, Stratigraphy, Unconsolidated aquifers, Bedrock, Water quality, Lake basins, Geomorphology, Aquifer management, Groundwater potential, Groundwater resources, Data collections, Groundwater basins, Water rights.

The Great Lakes Basin is underlain almost entirely by a thick succession of sedimentary rocks. The major structures include the large Michigan basin and a long, narrow structural platform, extending from Indiana to the St. Lawrence Valley. Crystalline rocks extrude in the western Lake Superior and Adirondack regions. Glacial and alluvial deposits covering the bedrock are as much as 1100 feet thick, with the thickest deposits generally occurring in Michigan and locally in buried bedrock valleys of New York and Wisconsin. The deposits range in composition from clay and silt, through sand and gravel, to boulders which are well sorted or a heterogeneous mixture. Groundwater is present everywhere throughout the Basin, but in limited quantities in areas where the basement rock is at or near the surface. Bedrock aquifers vary in their productivity, but they are more widespread, continuous, and generally more predictable in their potential than unconsolidated aquifers. Carbonate (limestone and dolomite) aquifers constitute the most common bedrock aquifers. Chemical quality of groundwater is generally good but varies considerably from area to area. Natural groundwater discharge or runoff was used to estimate basin yield as a means of determining the groundwater potential. Local pollution of shallow groundwater supplies is common, but current disposal restrictions will hopefully reverse this trend. Improper well design in multi-aquifer areas, especially where a poot-quality water zone is present, has been a problem in some areas. Unplanned groundwater development has caused problems. (Humphreys-ISWS)
W76-03863

EVALUATION AND PROPOSED STUDY OF POTENTIAL GROUND-WATER SUPPLIES, GALLUP AREA, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W76-03905

THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1974,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 4B.
W76-03911

HARFORD COUNTY GROUND-WATER INFORMATION: WELL RECORDS, CHEMICAL QUALITY DATA, AND PUMPAGE,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 7C.
W76-03912

FINITE ELEMENT SOLUTIONS TO TWO GROUNDWATER FLOW PROBLEMS - ONE INCLUDING DISPERSION AND THE OTHER THE INFLUENCE OF ELECTRO-OSMOSIS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-03962

2G. Water In Soils

DETACHMENT OF SOIL AGGREGATES BY SIMULATED RAINFALL FROM HEAVILY MANURED SOILS IN EASTERN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W76-03730

THE CALCULATION OF STEADY-STATE WATER-TABLE HEIGHTS IN DRAINED SOILS BY MEANS OF THE FINITE-ELEMENT METHOD,
Cambridge Univ. (England). Dept. of Applied Biology.
A. B. Gureghian, and E. G. Youngs.
Journal of Hydrology, Vol 27, No 1/2, p 15-32, October 1975. 13 fig, 1 tab, 30 ref.

Descriptors: *Subsurface drainage, *Soil water, *Finite element analysis, *Mathematical studies, *Numerical analysis, *Water table, Equations, Steady flow, Drains, Drainage systems, Percolation, Soil water movement, Saturated flow, Groundwater, Mathematical models.
Identifiers: Galerkin method, Method of weighted residuals, Triangular elements.

The use of a Galerkin-type finite-element method for the solution of steady-state drainage problems in both homogeneous and heterogeneous soils was described. The numerical procedure was shown to give satisfactory water-table heights in particular cases of ditch drainage in uniform and layered soils with given incident rainfall. The use of the method in more complex situations was illustrated with an example of a drained layered soil in which the backfill over a pipe drain created a vertical band of soil of different hydraulic conductivity. (Prickett-ISWS)
W76-03743

AMOUNT OF WATER NEEDED TO INITIATE FLOW IN RUBBLY ROCK PARTICLES,
Directorate General of Petroleum and Minerals, Muscat (Oman).
I. M. ElBoushi.
Journal of Hydrology, Vol 27, No 3/4, p 275-284, December 1975. 4 fig, 4 tab, 6 ref.

Descriptors: *Groundwater recharge, *Infiltration, *Field capacity, *Retention, *Gravitational water, Groundwater, Percolating water, Groundwater movement, Zone of saturation, Deep percolation, Soil water movement, Seepage, On-site laboratories, Laboratory tests, Flow, Specific retention, Natural recharge.
Identifiers: *Rubbly rock, Infiltration initiation, Threshold velocities.

The amount of water needed to start infiltratio and initiate flow was measured for dense, coarse granular material. Water volumes as low as 0.4 0.1% of total sample volume were needed to sta infiltration and cause flow. This does not suppo the earlier belief, based on studies of fine materia that infiltrating water has to satisfy the fie capacity and replenish water of retention befo any infiltration can occur. The factor responsib for this dissimilarity is that only the upper surfa of a column of gravel wets completely, whereas a short distance from the surface, the water ten to concentrate in small rivulets that occupy on half or less than half of the material. In additio not all the particle surfaces are wetted at low levels. Experiments showed that as little as 20% the particle surfaces were wetted at lower leve (Prickett-ISWS)
W76-03746

ANALYSIS OF THE PORE PRESSUR CHANGES FOLLOWING THE EXCAVATIO OF A SLOPE,
Hardy (R. M.) and Associates Ltd, Edmont (Alberta).
For primary bibliographic entry see Field 8D.
W76-03752

THE HYSTERESIS IN THE RELATIONSH BETWEEN HYDRAULIC CONDUCTIVITY A SOIL WATER CONTENT,
Agricultural Research Council, Cambric (England). Unit of Soil Physics.
A. Poulovassilis, and E. Tzimas.
Soil Science, Vol 120, No 5, p 327-331, Novem 1975. 4 fig, 9 ref.

Descriptors: *Soil water, *Soil moistu *Hysteresis, *Hydraulic conductivity, Por media, Drainage effects, Saturation, Wetting.

Experiments designed to study the relations between the hydraulic conductivity and the wa content of a porous body were performed on inert porous materials packed in long colum The experimental results obtained were presen They showed that the relationship is hysteretic that the repeated variation of the water con between any two limiting values results in a clo hysteretic loop. The relationship was subseque examined in the light of the domain theory. It found that the distribution function H for the ductivity elements may be considered as inde dent of the water contents at which the increm of water content reverses from negative to p tive and from positive to negative, respectiv and therefore that the conductivity elements be considered as independent. Distribution grams were obtained from an analysis of the mary depletion curves according to the inde dent domain concept. The hysteretic pths c ated by means of these diagrams showed satis tory agreement with the experimental p (Gibb-ISWS)
W76-03754

A MATHEMATICAL MODEL PHOSPHORUS MOVEMENT IN SOILS,
Michigan State Univ., East Lansing. Dept Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-03802

THE EFFECT OF SANITARY LANDFILLS WATER QUALITY IN SOUTHERN INDIAN
Indiana Univ., Bloomington. Dept. of Geogra
For primary bibliographic entry see Field 5B.
W76-03851

MICROSCOPIC-SCALE MODEL OF SOIL TER UPTAKE AND SALT MOVEMENT TO NT ROOTS,
as A and M Univ., College Station. Dept. of and Crop Sciences.
Hillel, C. G. E. M. van Beek, and H. Talpaz.
Science, Vol 120, No 5, p 385-399, November . 14 fig, 20 ref.

criptors: *Numerical analysis, *Soil water ement, *Moisture uptake, Salts, Root dis- tion, Root zone, Computer models, Computer rams, Equations, Pore pressure, Hydraulic luctivity, Salinity, Permeability, Drawdown, otic pressure, Flow rates, Transpiration, oenvironment, Depth, Solutes.
tifiers: Radial movement, 'Crown potential', movement.

merical model, based on the transport equa- for water and noninteracting solutes and en in IBM S/360 CSMP language, was ned to compute the radial movement of water alts to plant roots. The inputs were: the soil's on and conductivity functions, the soil solu- s content and concentration, root density and eability, and the required uptake rate ther constant or diurnally fluctuating). The t provided the time-dependent drawdown of c and osmotic potentials in the immediate ity of the root, the gradients and flow rates of r and solutes in the soil, and the plant water tials needed to maintain different uptake . The model was illustrated for various root- ensities and various initial water contents and oncentrations. The effect of increasing root ty and permeability was seen to be similar to ffect of increasing water content or reducing pirational demand. (Visocky-ISWS)
03860

NDIX 16, DRAINAGE, GREAT LAKES N FRAMEWORK STUDY.
Lakes Basin Commission, Ann Arbor, gan, Public Information Office.
rimary bibliographic entry see Field 4A.
03869

VALUATION OF THE ACCUMULATION, NSLOCATION, AND DEGRADATION OF ICIDES AT LAND WASTEWATER OSAL SITES,
rnia Univ., Berkeley. Sanitary Engineering rch Lab.
imary bibliographic entry see Field 5B.
03871

WATER NITRATE BENEATH A BROAD- N TERRACED FEEDLOT,
ska Univ., Lincoln. Agricultural Experiment n.
imary bibliographic entry see Field 5B.
3981

IES ON SUBSURFACE MOVEMENT OF UENT FROM PRIVATE SEWATE OSAL SYSTEMS USING RADIOACTIVE OYE TRACERS, PART 2, 1973-74,
o Ministry of the Environment, Toronto.
imary bibliographic entry see Field 5B.
4000

Lakes

RIMENTALLY INCREASED FISH STOCK IE POND TYPE LAKE WARNIAK. IX. ERS AND BIOMASS OF BOTTOM A,
Academy of Sciences, Warsaw. Inst. of y.
ak, and K. Dusoge.
ia Polska, Vol 21, No 35, p 563-571, 1973. 4 ib, 24 ref.

Descriptors: *Fish stocking, *Benthic fauna, *Biomass, Fish population, Fish food organisms, Diptera, Larvae, Oligochaetes.
Identifiers: *Lake Warniak(Poland), Trichoptera, Ephemeroptera, Heleidae, Sialis lutaria, Odonata, Lepidoptera, Chaoborus, Hirudinea, Asellus aquaticus.

Studies were made in Poland to determine food resources of the bottom zone for fish and to observe the effect of benthos consumption by fish. Chironomidae larvae contributed about 50% of benthic biomass. Biomass was high in spring and autumn and low in summer at all depths and for all fauna groups. When biomass and Chironomidae numbers were low, contribution of small larvae to biomass was greatest. Curves of benthos changes were similar each year, but differences between minimum and maximum were becoming less, average biomass of bottom fauna less, and percentage of Chironomidae total biomass more and that of some other groups less. The lake was moderately abundant in food for benthophagous fish. The average weight of individual larvae increased with depth. No differences were observed in occurrence of bottom fauna in different parts of the lake because fences were not tight so fish density was dispersed. The disappearance of big benthic worms in the last years of the studies, at the highest fish pressure, and the decrease in benthic biomass, show that fish feeding was the main reason for the changes in benthos. A decrease in primary production may also have occurred due to fish activity. (Buchanan-Davidson--Wisconsin)
W76-03539

LAKE HAKOJARVI, A POLYHUMIC LAKE IN SOUTHERN FINLAND,
For primary bibliographic entry see Field 5C.
W76-03540

INDIANA DUNES NATIONAL LAKESHORE (S 820).
For primary bibliographic entry see Field 6E.
W76-03600

ENVIRONMENTAL FACTORS AFFECTING THE STRENGTH OF WALLEYE (STIZOSTEDION VITREUM VITREUM) YEAR-CLASSES IN WESTERN LAKE ERIE, 1960-70,
Bureau of Sport Fisheries and Wildlife, Sandusky, Ohio. Biological Station.
For primary bibliographic entry see Field 5C.
W76-03653

SIGNIFICANCE OF DETRITUS OR DETRITUS-ASSOCIATED INVERTEBRATES TO FISH PRODUCTION IN A NEW IMPOUNDMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and, Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W76-03654

YELLOW PERCH (PERCA FLAVESCENS) BIOMASS RESPONSES TO DIFFERENT LEVELS OF PHYTOPLANKTON AND BENTHIC BIOMASS IN LAKE MEMPHREMAGOG, QUEBEC-VERMONT,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-03655

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
International Field Year for the Great Lakes (IFYGL) Bulletin No. 16, November 1975. 105 p, 12 fig, 6 tab.

Descriptors: *Great Lakes, *International waters, *International Hydrological Decade, *Canada, *United States, *Lake Ontario, Programs, Publications, Bibliographies, Water temperature, Air temperature, Data processing, Currents(Water), Dew point, Temperature.
Identifiers: International Field Year for the Great Lakes.

Listed were the official International Field Year for the Great Lakes (IFYGL) publications, joint Canadian-U.S. publications included in IFYGL Bulletin No. 15, and additions to the IFYGL bibliography. Nine abstracts of Canadian-authored IFYGL papers were included. U.S. information presented for Lake Ontario included monthly lake precipitation totals for 26 and 23 station networks; November 1972 daily lake precipitation totals; monthly wind histograms of wind 3 to 4 m above the lake surface for May through November; station locations for physical data collection system; and examples of rawinsonde data, water current direction, water temperature, air temperature, dew point temperature, and barometric pressure. Brief reports on both Canadian and U.S. scientific projects were included. Canadian and U.S. summaries of data available from final IFYGL archives were tabulated. (Humphreys-ISWS)
W76-03725

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
International Field Year for the Great Lakes (IFYGL) Bulletin No. 15, August 1975. 103 p, 16 fig, 9 tab.

Descriptors: *Great Lakes, *International waters, *International Hydrological Decade, *Canada, *United States, *Lake Ontario, Programs, Publications, Bibliographies, Water temperature, Currents(Water), Lakes, Lake stages, Water levels, Evaporation, Water loss.
Identifiers: International Field Year for the Great Lakes.

Listed were the official Internationl Field Year for the Great Lakes (IFYGL) publications, joint Canadian-U.S. publications included in IFGYL Bulletin No. 14, and additions to the IFYGL bibliography. Abstracts of nine Canadian-authored papers presented at the 18th Conference on Great Lakes Research in May 1975, Albany, N.Y., were included. U.S. information presented for Lake Ontario included monthly mean temperatures, monthly mean current speed, weighting factors and beginning-of-month water levels for ten gaging stations, lake storage, lake evaporation, and monthly resultant lake currents at 15m and 30m depths for May 1972 through October 1972. Brief reports on both Canadian and U.S. scientific projects were included. Canadian and U.S. summaries of data available from final IFYGL archives were tabulated. (Humphreys-ISWS)
W76-03726

LATERAL MOMENTUM FLUX IN BOUNDARY CURRENTS,
Woods Hole Oceanographic Institution, Mass.
G. T. Csanady.
Journal of Physical Oceanography, Vol 5, No 4, p 705-717, October 1975. 8 fig, 24 ref. NOAA 03-5-022-26, Brookhaven Nat. Lab. 32537-S.

Descriptors: *Currents(Water), *Momentum transfer, *Lakes, *Great Lakes, *Oceans, Circulation, Ocean currents, Flow, Winds, Model studies, Mathematical models, Oceanography.
Identifiers: *Boundary currents.

Some simple momentum advection effects were considered in a current aligned with the y axis on which there was superimposed a 'cross' flow in the x-z plane. The cross flow coupled with horizontal shear in the current tends to generate

differences along the vertical in the longshore velocity, while vertical mixing tends to even out such differences. A balance is possible between the two tendencies. The equilibrium velocity distribution may support considerable lateral mementum flux, which, in the case of zero rotation, is directed down the velocity gradient, allowing the definition of an effective horizontal viscosity. When rotational effects are significant, both the sense and the magnitude of the momentum flux come to depend in a complex way on the total vorticity. Some illustrative examples were calculated for cross flow produced by frictional effects in a boundary current. These showed that horizontal momentum flux by this type of cross flow can be significant in shallow water under some circumstances. A consideration of observational evidence from the Great Lakes lead to the conclusion that this mechanism of momentum transfer may well be responsible for the observed asymmetry of wind-generated coastal jets, i.e., the strengthening of the 'right-hand' jet (looking along the wind) at the expense of the left-hand jet. (Sims-ISWS)
W76-03732

LAKE ONTARIO MEAN TEMPERATURES AND CURRENTS IN JULY 1972,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
R. L. Pickett, and F. P. Richards.
Journal of Physical Oceanography, Vol 5, No 4, p 775-781, October 1975. 10 fig, 1 tab, 8 ref.

Descriptors: *Air temperature, *Currents(Water), *Wind velocity, *Lake Ontario, *Water temperature, *Density stratification, Thermocline, Lake breezes, Climatic data, Meteorology, Surface waters, Air circulation.
Identifiers: *Cyclonic flow, *Temperature spectrum, *Perturbations.

Monthly mean air and water temperatures and winds and currents were calculated for Lake Ontario for July 1972 from data collected during the International Field Year for the Great Lakes. The mean air temperature pattern was similar to the lake surface temperature pattern except in the northwestern part of the lake due to warm air around Toronto. Surface water temperatures showed warm water (greater than 19C) along the south-central shore and a cold pocket (16C) in the northwest. A subsurface cold pocket also occurred near the middle of the lake. Maximum perturbations of the mean temperature field occurred near the surface and thermocline at the lowest frequencies (less than 0.02 cycle/h). The diurnal temperature signal was significant near the surface, and the inertial signal was significant near the thermocline. Winds were from the west at about 3 m/s. In response, the thermocline tilted from 5 m along the northwestern shore to 14 m along the southern shore of the lake. Monthly resultant currents indicated cyclonic flow at all depths and a northbound flow off Rochester in the region of a bottom ridge. Observed currents were consistent with geostrophic calculations. Maximum current perturbations occurred near the surface at the lowest frequencies and at the inertial frequency. (Lardner-ISWS)
W76-03740

OUTPUT FROM A CASCADE OF DISCRETE LINEAR RESERVOIRS WITH STOCHASTIC INPUT,
Department of Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 2E.
W76-03742

SESTON COMPOSITION IN THE POINT PELEE AREA OF LAKE ERIE,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
For primary bibliographic entry see Field 5C.
W76-03787

SEMI-INFINITE SOLID MODEL FOR PREDICTION OF TEMPERATURE IN DEEP RESERVOIRS AND LAKES,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
L. J. Thibodeaux.
Water Resources Bulletin, Vol 11, No 3, p 449-454, June 1975. 2 fig, 1 tab, 5 ref. OWRT A-026-ARK(1).

Descriptors: *Lakes, *Reservoirs, *Thermal properties, *Hydrothermal studies, *Model studies, Heat flow, Heat transfer, Heat budget, Thermocline, Stratification, Epilimnion, Air-water interfaces.
Identifiers: Metalimnion, Hydrolimnion.

A lake or reservoir, heated mainly through the air-water interface, was visualized as a solid which is bounded by the interface plane (x = 0) and extends to infinity in the positive x-direction. Analytical expressions gave the surface temperature, the temperature profile (with depth), and the position of the thermocline as a function of time (Julian Day). Preliminary model results indicated that the general shape of the temperature profile and the position of the thermocline were influenced primarily by the air-water heat exchange and the time lapse since an isothermal condition existed in the water body. (Jess-ISWS)
W76-03852

APPENDIX 2, SURFACE WATER HYDROLOGY, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 2E.
W76-03862

APPENDIX 3, GEOLOGY AND GROUND WATER, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan , Public Information Office.
For primary bibliographic entry see Field 2F.
W76-03863

APPENDIX 7, WATER QUALITY, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 5A.
W76-03864

APPENDIX 11, LEVELS AND FLOWS, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 4A.
W76-03865

APPENDIX 12, SHORE USE AND EROSION, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 2J.
W76-03866

APPENDIX 14, FLOOD PLAINS, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 4A.
W76-03867

APPENDIX 15, IRRIGATION, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 3F.
W76-03868

APPENDIX 16, DRAINAGE, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 4A.
W76-03869

APPENDIX 18, EROSION AND SEDIMENTATION, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 2J.
W76-03870

A LATE HOLOCENE POLLEN RECORD FROM PEARSON'S POND, WEEKS CREEK LANDSLIDE, SAN FRANCISCO PENINSULA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2I.
W76-03896

HYDROLOGY OF MALHEUR LAKE, HARNEY COUNTY, SOUTHEASTERN OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W76-03906

2I. Water In Plants

TRITIUM FRACTIONATION IN PLANTS,
Environmental Monitoring and Support Lab., Las Vegas, Nev. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5A.
W76-03632

A MICROSCOPIC-SCALE MODEL OF SOIL WATER UPTAKE AND SALT MOVEMENT TO PLANT ROOTS,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 2G.
W76-03860

A LATE HOLOCENE POLLEN RECORD FROM PEARSON'S POND, WEEKS CREEK LANDSLIDE, SAN FRANCISCO PENINSULA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
D. P. Adam.
Journal of Research of the U.S. Geological Survey, Vol 3, No 6, p 721-731, November-December 1975. 6 fig, 2 tab, 23 ref.

Descriptors: *Dating, *Moisture content, *Geologic time, *Palynology, *California, Pollen, Distribution patterns, Sampling, Cores, Data collections, Climatology, *Ponds.
Identifiers: *San Francisco Peninsula(Calif), *Late Holocene, *Pollen types.

A 210-cm core from Pearson's Pond on San Francisco Peninsula, Calif., yielded a pollen record for the past 3 millenia. Prior to A.D. 1000 the pond biota was particularly sensitive to climatic fluctuations. Two wet intervals occur in the pollen record, between 350 B.C. and A.D. 0 and between A.D. 650 and 900. The pollen record suggests that the Weeks Creek landslide may have moved at least twice prior to 3,000 years ago and that the middle part of the slide has been stable since

ne. Seasonal changes produce large annual fluc-
ations in the water table, and climatic changes
uring the past 3,000 years have produced signifi-
nt changes in the timing and magnitude of the
nual changes. Climatic records such as the one
esented here will help us to understand and
parate the effects of climate and earthquakes on
e landslide history of the Holocene deposits of
e San Francisco Bay area. (Woodard-USGS)
76-03896

**LATE HOLOCENE POLLEN DIAGRAM
OM NEAR LAKE TAHOE, EL DORADO
UNTY, CALIFORNIA,**
ovenska Akademija Znanosti in Umetnosti,
ublijana (Yugoslavia); and Geological Survey,
enio Park, Calif.
Sercelj, and D. P. Adam.
rnal of Research of the U.S. Geological Sur-
y, Vol 3, No 6, p 737-745, November-December
75. 4 fig, 2 tab, 18 ref.

scriptors: *Dating,
recipitation(Atmospheric), *Geologic time,
alynology, *California, Pollen, Distribution pat-
ns, Sampling, Cores, Data collections, Cli-
tology.
ntifiers: *Sierra Nevada(Calif), *Late
iocene, Pollen records, *Pollen types.

,500-yr pollen record from an alpine meadow in
central Sierra Nevada, California, shows a
eral agreement with other more detailed pollen
ords from the late Holocene of California. Tree
ts from the site suggest dry conditions at about
0 and 1350 radiocarbon yr B.P. The site was
mpled during the summers of 1971, 1972, and
3. Several small springs keep the site moist dur-
the dry summer months. The drainage area
ding these springs is rather small, extending
n the site to the crest of the range; with the
st distant part of the drainage basin only about
km to the south of the springs. The discharge of
springs, as reflected by peat growth and the
en record of the surrounding vegetation,
uld therefore provide a good measure of
nges in the precipitation regime at the crest of
Sierra Nevada. (Woodard-USGS)
5-03897

Erosion and Sedimentation

**TACHMENT OF SOIL AGGREGATES BY
ULATED RAINFALL FROM HEAVILY
NURED SOILS IN EASTERN NEBRASKA,**
raska Univ., Lincoln. Dept. of Agronomy.
. Mazurak, L. Chesnin, and A. E. Tiarks.
Science Society of America Proceedings, Vol
No 4, p 732-736, July-August 1975. 3 fig, 3 tab,
f. OWRT B-012-NEB(4).

criptors: *Soil compaction, *Erosion,
braska, Simulated rainfall, Erosion rates,
lots, Raindrops, Rainfall intensity, Ag-
ates, Cultivation, Farm wastes, Particle size,
ite investigations.
tifiers: *Tillage depth, *Manured soil, Soil
chment, Manure, Splash erosion, Aggregate
distribution, Soil crust strength.

ld experiment was established to measure the
ts of annual applications of high rates of
ure for the production of crops under irriga-
The effects of incorporating the manure into
oil by disk plowing to depths of 10 cm, 20 cm,
30 cm on the stability of the soil mass was
ured under simulated rainfall conditions. The
t of simulated rainfall on soil surface compac-
as influenced by rate of application of manure
lepth of incorporation was measured with a
rometer. The amount of soil material
hed from undisturbed soil cores by simulated
rops was curvilinearly related to the rainfall
sity. When the plots were disk plowed to a
of 10 cm, soil detachment increased from 55
mg/ cu cm of water for the nonmanured plots to 89 mg/cu cm for the 415 metric tons/ha per year. The amount of soil particles detached by the raindrops was reduced about 15 mg/cu cm of water as the depth of disking manure into the soil was increased from 10 to 30 cm. Aggregate size distribution of the splashed material showed that prior application of manure to the soil increased the amount of soil aggregates in the large diameter classes. The penetrometer resistance of the crust formed by the waterdrops decreased from 36 kg/sq cm for nonmanured plots to 4.4 kg/sq cm for the plots receiving 360 metric tons of manure/ha/year. (Lee-ISWS)
W76-03730

STORMFLOWS AND EROSION AFTER TREE-LENGTH SKIDDING ON COASTAL PLAIN SOILS,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-03756

THE MACRO-INVERTEBRATE FAUNA OF THE INTERTIDAL SOFT SEDIMENTS OF SOUTH EAST ENGLAND,
Institute of Terrestrial Ecology, Norwich (England). Colney Research Station.
For primary bibliographic entry see Field 5B.
W76-03764

SESTON COMPOSITION IN THE POINT PELEE AREA OF LAKE ERIE,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
For primary bibliographic entry see Field 5C.
W76-03787

THE SIZE AND SHAPE OF SMALL-SCALE CURRENT RIPPLES: AN EXPERIMENTAL STUDY USING MEDIUM SAND,
Keele Univ. (England). Dept. of Geology.
N. L. Banks, and J. D. Collinson.
Sedimentology, Vol 22, No 4, p 583-599, November 1975. 10 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Particle size, *Particle shape, *Ripple marks, Froude number, Roughness(Hydraulic), Turbulence, Turbulent flow, Sediment transport, Flumes, Reynolds number, Hydraulics, Sediment-water interfaces, Laboratory tests.
Identifiers: Cumulative grain size, Ripple chordlength, Ripple height, Ripple index.

Flume experiments with medium sand confirmed the increasing complexity in the shape of small-scale current ripples with increasing flow velocity for constant depth. Experiments suggested that a measure of ripple shape (transverse to streamwise features) has a more complex relationship with the flow property (Froude Number and relative roughness), than was previously realized. It was suggested that hydraulic properties of the flow at the sediment water interface have a more general relationship with ripple form than do properties of the whole flow such as Froude and Reynolds Numbers. Properties of the whole flow tend to separate data into depth-related curves at shallow flows where the free water surface influences the structure of the turbulence. (Lee-ISWS)
W76-03854

AN EVALUATION OF CM PATTERNS FOR GRAIN-SIZE STUDIES OF FINE GRAINED SEDIMENTS,
Louvain Univ. (Belgium). Laboratorium voor Sedimentologie.
N. Vanderberghe.
Sedimentology, Vol 22, No 4, p 615-622, November 1975. 4 fig, 10 ref.

Descriptors: *Particle size, *Sediment transport, Particle shape, Suspended solids, Suspended load, Clays, Sedimentation, Sediments, Hydraulics.
Identifiers: *Grain-size distribution, *Boom clay(Belgium), Clay-rich sediments, Transport mechanism.

Grain-size data of Boom clay (Belgium) were represented on diagrams of: (1) the coarsest one percentile value-the median value, (2) the finer 2 micrometer percentile value-the median value, and (3) the finer 32 micrometer percentile value-the median value, as suggested by Passega. They showed a typical 'uniform suspension' pattern. It was argued that a 'uniform suspension' pattern can be due simply to the clay-rich nature of the sediments. As these sediments are not deposited by a single transport mechanism, the 'uniform suspension' pattern does not necessarily indicate a specific transport mechanism. (Lee-ISWS)
W76-03855

STREAM CHANNEL MEASUREMENTS IN NEW ZEALAND,
Victoria Univ., Wellington (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 7A.
W76-03856

LOCAL EROSION CAUSED BY RAPID FORCED INFILTRATION,
Aberdeen Univ. (Scotland). Dept. of Engineering.
B. B. Willetts, and M. E. Drossos.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY12, Proceedings Paper 11796, p 1477-1488, December 1975. 6 fig, 8 ref, 2 append.

Descriptors: *Stream erosion, *River beds, *Alluvial channels, Europe, Bed load, Hydraulics, *Infiltration, Open channel flow, Rivers, Sediment transport, Seepage, Dunes, Intakes, Hydraulic structures, Hydraulic models, Sedimentation rates, Traction.
Identifiers: *Suction, Streambed stability, Ripple regime, Boundary shear stress.

Examination of the stream bed over a water intake buried beneath it revealed a scoured hole with a dune downstream. Laboratory experiments resulted in the same kind of feature, providing the bed material is too penetrative to ripple. Theoretical treatment based on momentum changes in the suction zone and limited to two dimensions reproduced, with reasonable success, the behavior of beds of medium sand in a narrow laboratory flume. Grains move faster in the suction zone than elsewhere and their increased reluctance to settle is offset by increased stability of the stationary grains. A stable bed feature is arrived at when these two effects are so balanced that the transport rate of bed load is the same in the suction zone as elsewhere. (Lee-ISWS)
W76-03858

SEDIMENT MOVEMENT AND FRICTION IN ALLUVIAL STREAMS,
Nigeria Univ., East Central State. Dept. of Agricultural Engineering.
C. G. Ilo.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY12, p1559-1566, December 1975. 3 fig, 12 ref.

Descriptors: *Sediment transport, *Sedimentation rates, River beds, Alluvial channels, Bed load, Hydraulics, Open channel flow, Shear stress, Sediment discharge, Froude number, Particle size, Suspended load, Dunes, Sands.
Identifiers: *Total sediment load, *Alluvial streams, Bed forms, Shields' diagram, Friction factor.

Total bed material discharge was treated, rather than separate estimates of suspended and bed

transport. Most hydraulic problems associated with sediment transport can be more effectively solved by considering total sediment discharge because of the uncertainties in finding when or where the sediments are being transported as suspended, or bed load, especially in the presence of bed forms. Available laboratory and field data of canals and natural rivers, involving a reasonably wide variety of sediment and stream characteristics, were used to illustrate the applicability of the function: they include the geometric mean diameter of 0.09 mm-7.60 mm and river depths of up to 11.5 m. A proposal was also included for forecasting bed form regimes under different flow and sediment characteristics. The following conclusions were reached: (1) Froude number and shear stress ratio appear to be adequate parameters for determining bed form regimes; (2) Shields' scour function may be represented mathematically by simple regression equations; (3) friction factor in alluvial streams is a function of the shear-velocity-particle-diameter Reynolds number; and (4) the total sediment discharge of alluvial streams may be adequately determined by very simple equations which consider the Froude number, the specific gravity of the sediment, particle size, and stream slope as the dominant factors. (Lee-ISWS)
W76-03859

EFFECT OF FLOW RATE AND CANOPY ON RILL EROSION,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
L. D. Meyer, G. R. Foster, and S. Nikolov.
Transactions of the American Society of Agricultural Engineers, Vol 8, No 5, p 905-911, September- October 1975. 7 fig, 3 tab, 18 ref.

Descriptors: *Flow rates, *Canopy, *Erosion, *Rill erosion, Channels, Soil erosion, Runoff, Raindrops, Rain, Sediment load, Inflow, On-site investigations, Shear stress, Aggregates, Rainfall intensity, Discharge(Water).
Identifiers: Soil detachment, Tillage marks, Raindrop impact, Headcuts, Knickpoints, Interrill erosion.

The influence of flow rate on rill erosion was determined from field studies. The data suggested that rill erosion does not begin until flow reaches a critical rate, and equations incorporating this concept were fitted to the experimental data. Observations and further analyses indicated that rill erosion might be separated into rill shear and rill headcut components with separate terms for each. Relationships using independently evaluated rill and interrill erosion components were compared with the relationship used for the slope-length factor in the Universal Soil Loss Equation. They agreed quite well for slope lengths up to about 45 m but diverged considerably at greater lengths. This research was conducted at temperatures near freezing and at only one slope steepness and soil condition; thus the results were primarily indicative. (Roberts-ISWS)
W76-03861

APPENDIX 12, SHORE USE AND EROSION, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
1975. 173 p, 22 fig, 46 tab, 30 maps, 34 ref, 2 append.

Descriptors: *Great Lakes, *Shore protection, *Erosion, *Waves(Water), *Costs, *Great Lakes Region, Erosion control, Islands, Winds, Regulation, Damages, Flood damage, Shores, Lakes, Management, Planning, Lake shores, Land use.
Identifiers: *Shoreland planning and management.

This appendix is a study of the United States shorelands and islands of the Great Lakes. The report described in detail the composition of the shorelines, locations of structural development areas, forested lands, recreational areas, and various distinct physical characteristics. The existence of fish and wildlife, marshes, history of the lakes and shorelines, and physical characteristics of the islands were also described. It was pointed out that shore erosion is the major problem along the Great Lakes shoreland. Wind-generated wave action caused greatest amount of erosion damage, although seepage, frost and ice action, and surface runoff caused some erosion of the lake shores. This massive shore erosion covers 70% or 2500 miles of the Great Lakes shore. Various preventive and regulatory measures were discussed to develop a workable shoreland planning and management program. The cost of the shore protection was estimated to be $100 to $500 per foot of shoreline. (Bhowmik-ISWS)
W76-03866

APPENDIX 18, EROSION AND SEDIMENTATION, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
1975. 127 p, 50 fig, 47 tab, 42 ref.

Descriptors: *Great Lakes Region, *Erosion, *Sedimentation, *Illinois, *Indiana, *Michigan, *Minnesota, *New York, *Ohio, *Pennsylvania, *Wisconsin, Erosion rates, Channel erosion, Sheet erosion, Bank erosion, Wind erosion, Cities, Erosion control, Basins, Data collections, Suspended load, Sedimentation rates, Reservoir silting, Land, Agriculture, Forests, Dredging, Harbors, Navigation, Water quality, Geomorphology, Organic matter.

This report surveys the phenomena of erosion and sedimentation processes as they occur in the Great Lakes Region. Local mean rates of erosion from various sources (sheet erosion, channel erosion, bank erosion, and urban construction) were quantified. Resulting rates of sedimentation and other damages were explored. A major aspect of this study was the presentation of future trends in erosion and sedimentation rates. These rates, based upon economic projections of land needs for crop production and urban expansion, were presented by Basin planning subarea. Future needed amounts of erosion control measures on rural lands were analyzed, and the acres of urbanizing land needing erosion protection were presented. Limitations of existing programs to reduce erosion and sedimentation to levels acceptable for future needs were surveyed. Alternative methods and procedures were discussed, and general recommendations for future action were expressed. The physical characteristics of the various planning subareas in the Basin, as they relate to effects on erosion and sedimentation rates, were defined. (Humphreys-ISWS)
W76-03870

SUSPENDED SOLIDS IN WATER.
Office of Naval Research, Arlington, Va. Ocean Science and Technology Div.
For primary bibliographic entry see Field 2L.
W76-03876

PRINCIPLES OF STUDYING SUSPENDED MATERIALS IN WATER,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W76-03877

STOKES' SETTLING AND CHEMICAL REACTIVITY OF SUSPENDED PARTICLES IN NATURAL WATERS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2L.
W76-03878

BEAM TRANSMISSOMETERS FOR OCEANOGRAPHIC MEASUREMENTS,
Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
For primary bibliographic entry see Field 2L.
W76-03879

VOLUME-SCATTERING FUNCTIONS IN OCEAN WATERS,
Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
For primary bibliographic entry see Field 2L.
W76-03880

MIE-THEORY MODELS OF LIGHT SCATTERING BY OCEAN PARTICULATES,
Miami Univ., Coral Gables, Fla. Dept. of Physics.
For primary bibliographic entry see Field 2L.
W76-03881

SPATIAL DISTRIBUTION OF THE INDEX OF REFRACTION OF SUSPENDED MATTER IN THE OCEAN,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2L.
W76-03882

ABSOLUTE CALIBRATION OF A SCATTERANCE METER,
Texas A and M Univ., College Station. Dept. of Physics.
For primary bibliographic entry see Field 2L.
W76-03883

EFFECTS OF TROPICAL STORM AGNES ON THE SUSPENDED SOLIDS OF THE NORTHERN CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W76-03884

DISTRIBUTION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN SUBMARINE CANYONS OFF SOUTHERN CALIFORNIA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.; and National Oceanic and Atmospheric Administration, Miami Fla. Marine Geology and Geophysics Lab.
For primary bibliographic entry see Field 2L.
W76-03885

CONTINUOUS LIGHT-SCATTERING PROFILES AND SUSPENDED MATTER OVER NITINAT DEEP-SEA FAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-03886

PHYSICAL, CHEMICAL, AND OPTICAL MEASURES OF SUSPENDED-PARTICLE CONCENTRATIONS: THEIR INTERCOMPARISON AND APPLICATION TO THE WEST AFRICAN SHELF,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 2L.
W76-03887

THE DISTRIBUTION OF PARTICULATE MATTER IN A NORTHWEST AFRICAN COASTAL UPWELLING AREA,
Copenhagen Univ., Denmark. Inst. of Physical Oceanography.
For primary bibliographic entry see Field 2L.
W76-03888

: SUSPENDED MATERIAL OF THE AZON SHELF AND TROPICAL ATLANTIC EAN,
aware Univ., Lewes. Coll. of Marine Studies.
primary bibliographic entry see Field 2L.
-03889

BIDITY DISTRIBUTION IN THE DEEP TERS OF THE WESTERN ATLANTIC OUGH,
ont-Doherty Geological Observatory, ades, N.Y.
primary bibliographic entry see Field 2L.
-03890

IATIONS IN BENTHIC BOUNDARY ER PHENOMENA: NEPHELOID LAYER IN NORTH AMERICAN BASIN,
ont-Doherty Geological Observatory, ades, N.Y.
primary bibliographic entry see Field 2L.
-03891

RIBUTION OF SUSPENDED PARTICLES HE EQUATORIAL PACIFIC OCEAN,
on State Univ., Corvallis. School of Oceanog-
rimary bibliographic entry see Field 2L.
03892

ENDED MATTER AND THE STABILITY HE WATER COLUMN: CENTRAL CARIB-N SEA,
A and M Univ., College Station. Dept. of nography.
rimary bibliographic entry see Field 2L.
03893

T-SCATTERING MEASUREMENTS AND MICAL ANALYSIS OF SUSPENDED TER IN THE NEAR-BOTTOM NEPHE- LAYER OF THE GULF OF MEXICO,
A and M Univ., College Station. Dept. of nography.
rimary bibliographic entry see Field 2L.
03894

T SCATTERING AND SUSPENDED PAR-LATE MATTER ON A TRANSECT OF ATLANTIC OCEAN AT 11 DEG N,
rsity of South Florida, St. Petersburg. Dept. rine Science.
rimary bibliographic entry see Field 2L.
03895

SNOW RUNOFF EVENTS AFFECT AMFLOW AND WATER QUALITY,
Service (USDA), Laramie, Wyo. Forest and Watershed Lab.
imary bibliographic entry see Field 4D.
3965

MENT TRANSPORT FROM BIG BRUSH WATERSHEDS,
Service (USDA), Laramie, Wyo. Forest and Watershed Lab.
imary bibliographic entry see Field 4D.
3966

Chemical Processes

ISOTOPIC SYSTEMATICS AND AGES RCHAEAN ACID INTRUSIVES IN THE OORLIE-NORSEMAN AREA, WESTERN RALIA,
lian National Univ., Canberra. Research of Physical Sciences.
Oversby.

Geochimica et Cosmochimica Acta, Vol 39, No 8, p 1107-1125, 1975. 11 fig, 10 tab, 51 ref.

Descriptors: *Heavy metals, *Lead radioisotopes, *Uranium radiosiotopes, *Geologic time, *Geological surveys, Geomorphology, Geology, Systematics, Age, Geologic history, Mass spectrometry, Anion exchange, Rocks, Rock properties, Chemical precipitation, Mineralogy, Australia.
Identifiers: Isochrons, Kalgoorlie-Norseman Area(Western Australia), Intrusions, Crustal history, Plutonic rocks, Geological dataing, K-feldspar, Plagioclase, Magma generation, Continental crust, Greenstone belts, Cratonic regions.

Lead-lead mineral isochrons consisting of K-feldspar, plagioclase, and total rock have been determined for eight intrusive bodies in the Kalgoorlie-Norseman area of Western Australia. The ages found range from 2630 to 2760 million years. Variation of initial lead isotopic composition within plutons has been identified in two cases. For the remaining plutons, whole rock lead-lead isochrons give the same age as the mineral isochrons. Attempts to determine uranium-lead ages reveal largescale loss of uranium from surface rocks in recent times. The initial lead isotopic composition of the intrusions shows that the source regions for the plutonic magmas must have experienced multistage histories prior to magma generation. The time integrated micron value for the source region in all cases exceeds the mean micron value for the Earth. Multistage model calculations show that continental type rocks must have been present in the Norseman area as early as 3300 million years ago. Original formation of continental crust near Kalgoorlie either occurred much later than at Norseman, or consisted of more basic rock types. The rock samples were crushed, dissolved in acid, purified by anion exchange, and analyzed by mass spectrometry. (Davis-Vanderbilt)
W76-03642

HEAVY METAL BINDING COMPONENTS OF RIVER WATER,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-03651

CONTRIBUTIONS TO THE CHEMISTRY OF ANTARCTIC SNOW: DETERMINATION OF TRACE ELEMENTS AT THE PPB LEVEL BY ATOMIC ABSORPTION SPECTROMETRY,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2C.
W76-03728

CONTRIBUTION TO THE CHEMISTRY OF ANTARCTIC SNOW: TRACE ELEMENT DOSAGE BY NEUTRON ACTIVATION,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2C.
W76-03729

STOKES' SETTLING AND CHEMICAL REACTIVITY OF SUSPENDED PARTICLES IN NATURAL WATERS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2L.
W76-03878

HYDROLOGY OF MALHEUR LAKE, HARNEY COUNTY, SOUTHEASTERN OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W76-03906

WATER QUALITY IN RHODE RIVER AT SMITHSONIAN INSTITUTION PIER NEAR ANNAPOLIS, MARYLAND, APRIL 1970 THROUGH DECEMBER 1973,
Geological Survey, Edgewater, Md. Chesapeake Bay Center.
For primary bibliographic entry see Field 5A.
W76-03914

METHODS FOR COLLECTION AND ANALYSIS OF AQUATIC BIOLOGICAL AND MICROBIOLOGICAL SAMPLES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-03915

2L. Estuaries

POTENTIAL EFFECTS OF AQUACULTURE ON INSHORE COASTAL WATERS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W76-03585

INLAND BOUNDARIES OF A STATE'S ZONE.
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
For primary bibliographic entry see Field 6E.
W76-03624

TIDAL DATUMS AND MAPPING TIDAL BOUNDARIES,
National Ocean Survey, Rockville, Md.
For primary bibliographic entry see Field 6E.
W76-03625

LEGAL ASPECTS OF TIDAL BOUNDARIES OF THE COASTAL ZONE,
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 6E.
W76-03626

MICROBIAL-MALATHION INTERACTIONS IN ARTIFICIAL SALT-MARSH ECOSYSTEMS: EFFECT AND DEGRADATION,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W76-03634

EPIZOOTIOLOGY OF TUMORS IN A POPULATION OF JUVENILE ENGLISH SOLE (PAROPHRYS VETULUS) FROM PUGET SOUND, WASHINGTON,
Washington Univ., Seattle. Fisheries Research Inst.
For primary bibliographic entry see Field 5C.
W76-03657

PLANKTONIC ECOSYSTEMS. THE EFFECTS OF DYSTROPHIC CONDITIONS ON STRUCTURE AND FUNCTION IN THE GULF OF FOS (ECOSYSTEME PLANCTONIQUE. STRUCTURE ET FONCTIONNEMENT EN RELATION AVEC DES PHENOMENES DE DYSTROPHIE (GOLFE DE FOS)),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Hydrobiologie Marine.
For primary bibliographic entry see Field 5C.
W76-03658

MAN-MADE EUTROPHICATION IN A NEWFOUNDLAND (CANADA) HARBOUR,
Queens Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.

W76-03659

ON THE POSSIBILITIES OF COASTAL, MID-SHELF, AND SHELF BREAK UPWELLING,
Florida State Univ., Tallahassee. Dept. of Oceanography.
Y. Hsueh, and H-W. Ou.
Journal of Physical Oceanography, Vol 5, No 4, p 670-682, October 1975. 16 fig, 8 ref, 1 append. NSF GX-33502, ONR N0014-67-A-0235-0002.

Descriptors: *Upwelling, *Circulation, *Continental shelf, *Model studies, Oceans, Ocean circulation, Ocean currents, Winds, Stress, Coasts, Mathematical models, Density, Density stratification, Flow, Boundary layers, Topography, Oceanography.

The steady-state circulation on a continental shelf under the combined influence of a wind stress, a surface density distribution, and a longshore current over the shelf break was investigated in a linear, beta-plane model that allowed a longshore pressure gradient. The problem was quasi-two-dimensional and lent itself readily to a standard boundary-layer analysis. For the range of parameters considered, the hydrostatic Lineykin layer allowed a vertical mass transport into the surface Ekman layer to compensate for the one-sided divergence created by the wind stress at the coast and was, therefore, primarily responsible for coastal upwelling. An equatorward longshore current over the shelf break, on the other hand, contributed to a shelf break upwelling. There is, in this case, also a possibility for a poleward undercurrent over the continental shelf. When the equatorward longshore velocity at the shelf break bottom is sufficiently large, however, the poleward undercurrent may not exist at all, and the whole shelf water may move equatorward. The resulting onshore transport in the bottom Ekman layer then causes upward motion, and allows for an appearance of coastal upwelling in the presence of upwelling at the continental shelf break. The interior density anomaly in the model was always diffusive and admitted an upwelling circulation beneath sharp surface contrasts with a shoreward gradient. (Sims-ISWS)
W76-03731

LATERAL MOMENTUM FLUX IN BOUNDARY CURRENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2H.
W76-03732

THE STRUCTURE AND DYNAMICS OF THE OCEAN SURFACE MIXED LAYER,
National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
G. L. Mellor, and P. A. Durbin.
Journal of Physical Oceanography, Vol 5, No 4, p 718-728, October 1975. 15 fig, 26 ref. NOAA 04-3-022-33.

Descriptors: *Model studies, *Mathematical models, *Oceans, *Temperature, Boundary layers, Mixing, Thermocline, Physical properties, Energy budget, Ocean circulation, Oceanography.
Identifiers: *Surface mixed layer.

A one-dimensional unsteady model of the ocean surface mixed layer was described. The Reynolds differential equations for turbulent ocean layers were the starting point; mixing coefficients for mementum and heat were then provided empirically. In the present model all empirical constants were obtained from neutral turbulence data. Numerical calculations were restricted to horizontally homogeneous layers, but stationary and nonstationary flows may be treated. Comparisons of prediction and data were favorable. (Sims-ISWS)
W76-03733

ON THE GENERATION OF MESOSCALE EDDIES AND THEIR CONTRIBUTION TO THE OCEANIC GENERAL CIRCULATION. I. A PRELIMINARY NUMERICAL EXPERIMENT,
National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
W. R. Holland, and L. B. Lin.
Journal of Physical Oceanography, Vol 5, No 4, p 642-657, October 1975. 16 fig, 15 ref, 1 append. NOAA 04-03-022-33.

Descriptors: *Ocean circulation, *Model studies, *Mathematical models, *Eddies, Flow, Winds, Currents(Water), Ocean currents, Viscosity, Stress, Momentum transfer, Energy transfer, Oceanography.
Identifiers: Baroclinic instability, Mesoscale eddies.

Numerical experiments on the wind-driven ocean circulation in a closed basin show that mesoscale eddies can appear spontaneously during the integration of the equations of motion for a baroclinic ocean. For some values of the basic parameters governing the flow, the solutions reach a steady state, while for other values finite-amplitude eddies remain a part of the final statistically steady state. In the eddying cases the solutions can be regarded as a mean flow upon which is superimposed a set of eddies which propagate westward at a few kilometers per day. The eddies typically have horizontal wavelengths of a few hundred kilometers. Analyses of the energetics show the eddies to be generated by the process of baroclinic instability. The potential energy of the mean flow is released to supply energy to the eddies. The computed Reynolds stresses, while small compared to the terms in the geostrophic balance of the mean momentum equations, do have a strong influence on the mean circulation. If the flow were steady, there would be no flow in the deep layer in this model. The vorticity balance of the mean flow is strongly affected by the presence of mesoscale eddies. In this report, the two-layer model and its numerical formulation was described. Then the results of a preliminary eddy experiment were discussed in detail, showing the spontaneous growth of baroclinic eddies and describing the final statistical steady state that occurs. (See also W76-03735) (Sims-ISWS)
W76-03734

ON THE GENERATION OF MESOSCALE EDDIES AND THEIR CONTRIBUTION TO THE OCEANIC GENERAL CIRCULATION. II. A PARAMETER STUDY,
National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
W. R. Holland, and L. B. Lin.
Journal of Physical Oceanography, Vol 5, No 4, p 658-669, October 1975. 15 fig, 2 tab, 13 ref. NOAA 04-03-022-33.

Descriptors: *Ocean circulation, *Model studies, *Mathematical models, *Eddies, Flow, Winds, Currents(Water), Ocean currents, Viscosity, Stress, Momentum transfer, Energy transfer, Oceanography.
Identifiers: Mesoscale eddies.

In this investigation, the wind- driven ocean circulation theories were extended to include mesoscale eddies as an integral part of the general circulation of the ocean. A two-layer numerical model of ocean circulation in a simple, rectangular basin driven by a steady wind stress was used for this purpose. The equations of motion were integrated as an initial value problem until the solutions reached either a steady state or, in the case of an ocean in which eddies have appeared spontaneously as a result of baroclinic instability, a statistically steady state. Part I of this study discussed the formation of the numerical model and presented results from a preliminary numerical experiment. In this part of the study, results from 10 additional experiments were examined to understand h eddy generation and the resulting eddy statist depend upon the basic parameters describing model ocean. In particular, the dependence results on the coefficient of lateral viscosity, wind stress amplitude, the wind stress distribut (one and two gyres), the basin size, and the bo dary conditions (slip and no-slip) were discuss Results showed a wide range of model behav under the conditions examined, but the comm result was that the mean circulation of eddy oceans is importantly altered, even largely de mined, by the statistical nature of the eddy fi (See also W76-03734) (Sims-ISWS)
W76-03735

OCEANIC VELOCITY GRADIENTS,
Texas A and M Univ., College Station. Dept Oceanography.
A. D. Kirwan, Jr.
Journal of Physical Oceanography, Vol 5, No 729-735, October 1975. 3 tab, 16 ref.

Descriptors: *Model studies, *Mathema models, *Oceans, *Ocean circulation, Veloc Circulation, Currents(Water), Flow, Cor force, Winds, On-site data collections, Ocea raphy.
Identifiers: *Velocity gradients.

A theoretical and experimental investigation o nature of oceanic velocity gradients presented. Starting with the equations of mo equations governing the dynamic behavio velocity gradients along with a first integral derived. These 9 equations were partitioned ferently than in a previous derivation so as to plify the physical interpretation. It was pointe that solutions to the gradient equations overs fy the equations of motion. This lead to development of compatibility conditions fo solutions. These conditions generalized si equations used in elasticity. The general gra equations were applied to two-dimens horizontal flow. This application demonstrate role that the wind field and bottom topograph play in generating velocity gradients. Free tions to the linearized gradient equations discussed. The solutions showed that in gravitational waves can be present in the gra fields. A summary of observations of ve gradients was given. Although the observa were made in different locales and by dif procedures, the range in values was surpri small. These data were also used to evalua relative sizes of some of the various terms gradient equations. The dominant terms a ones involving Coriolis while the beta term the least significant. The data also suggeste the geostrophic vorticity formula is not a r approximation in strong current regimes. ISWS)
W76-03736

INTERACTION OF SMALL-AMPLITUDE FACE GRAVITY WAVES WITH SUR CURRENTS,
Physical Dynamics, Inc., Berkeley, Calif.
J. A. Thomson, and B. J. West.
Journal of Physical Oceanography, Vol 5, N 736-749, October 1975. 10 fig, 19 ref, 2 a DARPA F30602-C-0494.

Descriptors: *Model studies, *Mathe models, *Ocean waves, *Currents(Water), ty waves, Internal waves, Waves(Water), Oceanography.
Identifiers: *Wave patterns, *Surface slic teraction, Surface currents.

The one-dimensional interaction of surface waves with nondispersive internal waves died in a linear approximation by solving th tions of motion in a coordinate system with the time-independent surface current induced by the internal wave. A range of

elengths was found which was reflected by the ent system (as seen in this coordinate system). he ocean-fixed frame, these waves were tified as waves which interact strongly with internal waves and exchange energy with it. effect on the surface wave pattern and the ion to surface slicks was discussed. (Sims-S)
-03737

ERVATIONS OF THE DIRECTIONAL CTRUM OF OCEAN WAVES USING A VERLEAF BUOY,
arch Inst. for Applied Mechanics, Fukuoka an).
itsuyasu, F. Tasai, T. Suhara, S. Mizuno, and hkusu.
nal of Physical Oceanography, Vol 5, No 4, p 60, October 1975. 14 fig, 1 tab, 12 ref, 1 ap-.

riptors: *Ocean waves, *On-site investiga-, *Buoys, Waves(Water), Analytical iques, Oceans, Bays, Winds, Data collec-, Measurement, Data processing, Oceanog-.
ifiers: *Directional wave spectra, Spectral sis.

ysis of the directional spectra of typical sets rface wave data obtained using a cloverleaf system in the open sea and a bay were re-d. It was shown that the directional wave rum can be approximated by the product of requency spectrum and a unimodal angular bution with mean direction approximately to that of the wind. It was also shown that is forms of frequency spectra exist, even in ely simple wave systems, depending on generating conditions. Ocean waves at fairly dimensionless fetches showed spectral with very narrow spectral width, similar to of laboratory wind waves. On the other the spectral forms for ocean waves at very limensionless fetches were quite similar to ierson-Moskowitz spectra, which are con-d, within our present data, to be the wave a with the largest spectral width. Finally, exist many ocean waves at moderate dimen-ss fetches, which showed spectral forms nterminate spectral widths lying between the two extremes. However, a definite relation-etween the spectral width and the dimen-ss fetch has not been obtained in the present (Sims-ISWS)
3738

SCALE VARIABILITY OF SEA SURFACE ERATURES,
a State Univ., Tallahassee. Dept. of rology.
Holladay, and J. J. O'Brien.
l of Physical Oceanography, Vol 5, No 4, p 2, October 1975. 14 fig, 1 tab, 29 ref. NOAA 22-28, NSF GX-33502.

ptors: *Oceans, *Temperature, *Upwelling, n, Coasts, Circulation, Ocean circulation, Fish, Salmon, Water temperature, Sea Data collections, Measurement, Data sing, Analytical techniques, Variability, graphy.
iers: *Sea surface temperatures, COHO .

of an investigation of the nature of the ale variability of sea surface temperature n the upwelling zone off the central coast of were presented. A knowledge of SST ale variability is important toward un-ding the mesoscale air-sea interaction in an upwelling zone. Almost-daily sea temperature data gathered by remote techniques provided the basis for this in-tion. These data were gathered over a 60-riod during the COHO Project in summer 1973. In order to study the influence of wind forcing on the mesoscale SST field, wind data were gathered from an anemometer located at Newport, Oregon. Some important results of this investigation were: (1) the daily SST fields respond rapidly to wind forcing, (2) the three-week mean SST's tend to follow the large-scale bathymetry, and (3) identification of SST eddies from day to day on daily perturbation (from the three-week means) maps is made difficult because of the existence of strong horizontal flow and strong shear in the longshore current. Other important results were revealed by a two-dimensional spectral analysis of the daily horizontal sea surface temperature fields and the perturbation fields. This analysis indicated that a large amount of variance of the sea surface temperature is concentrated in the 16-40 km wavelength range, and over the range of scales from 4-20 km the isotropic part of the temperature variance spectrum obeys a -3 power law. (Sims-ISWS)
W76-03739

EFFECTS OF PULSATING WIND ON VELOCITY PROFILES AND MICROSTRUCTURES,
Delaware Univ., Newark. Coll. of Marine Studies.
J. Wu.
Journal of Physical Oceanography, Vol 5, No 4, p 782-789, October 1975. 6 fig, 1 tab, 15 ref. ONR N00014-75-C-0285.

Descriptors: *Winds, *Waves(Water), *Laboratory tests, Equipment, Measurement, Instrumentation, Velocity, Variability, Fluctuations, Data processing, Analytical techniques, Oceanography.
Identifiers: *Pulsating winds, Microstructures, Friction velocities.

Friction velocities of pulsating winds were measured, as well as slope and curvature distributions of the disturbed water surface. The results obtained with the same average wind speed, but with pulsations of various frequencies and amplitudes, were compared. The pulsations were found to be critical on wind and wave structures when the regime of the wind boundary layer is affected. The influence of pulsations becomes secondary, when the wind boundary layer is aerodynamically rough. A distinct feature of this regime, generally occurring in the field, is that more capillaries are produced by pulsating winds. (Sims-ISWS)
W76-03741

THE ECOLOGY OF SUBLITTORAL COMMUNITIES AT ABEREIDDY QUARRY, PEMBROKESHIRE,
University Coll. of North Wales, Bangor. Dept. of Marine Biology.
For primary bibliographic entry see Field 5C.
W76-03763

THE MACRO-INVERTEBRATE FAUNA OF THE INTERTIDAL SOFT SEDIMENTS OF SOUTH EAST ENGLAND,
Institute of Terrestrial Ecology, Norwich (England). Colney Research Station.
For primary bibliographic entry see Field 5B.
W76-03764

NATURAL FLUCTUATIONS IN A SOFT BOTTOM BENTHIC COMMUNITY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W76-03765

THE EFFECTS OF TEMPERATURE ON THE DEVELOPMENT AND SURVIVAL OF THE EGGS AND LARVAE OF THE ATLANTIC SILVERSIDE, MENIDIA MENIDIA,
New York Ocean Science Lab., Montauk. Dept. of Fisheries Oceanography.
For primary bibliographic entry see Field 5C.
W76-03777

RELATIVE IMPORTANCE OF FOOD AND WATER IN LONG-TERM ZINC-65 ACCUMULATION OF MARINE BIOTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5C.
W76-03780

IDENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5A.
W76-03781

QUANTITATIVE BIOLOGICAL ASSESSMENT OF THE BENTHIC FAUNA IN DEEP BASINS OF THE GULF OF MAINE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W76-03783

REVIEW OF THE MODELS OF TIDAL WATERS,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W76-03798

THE RIVER THAMES FLOOD DEFENCE BARRIER,
Great London Council, (England), Dept. of Public Health Engineering.
For primary bibliographic entry see Field 4A.
W76-03800

DETERMINING ULTIMATE CAPACITY OF THE COASTAL ZONE FOR WASTEWATER AND WASTEWATER RESIDUALS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 5E.
W76-03847

SOME CHARACTERISTICS OF THE BEAUFORT SEA SHELF CURRENT,
Coast Guard Research and Development Center, Groton, Conn.
G. L. Hufford.
Journal of the Geophysical Research, Vol 80, No 24, p 3465-3468, August 20, 1975. 5 fig, 7 ref.

Descriptors: *Currents(Water), *Ocean currents, *Ocean circulation, *Arctic ocean, Continental shelf, Continental slope, Current meters, Winds, On-site investigations, Oceanography.
Identifiers: *Beaufort Sea.

A 15-day current record was obtained from a 25-m depth on the Beaufort Sea Shelf approximately 83 km northeast of Barrow, Alaska, during August 1972. This is one of the longest continuous current records for the shelf area. The current observed at 25 m showed a mean flow to the east but was subject to irregularities and wide day-to-day variations. The local wind, although the major cause of many of the fluctuations, was not the primary driving force of the eastward flow. The eastward motion of the current appeared to be dominated by the momentum present in the flow prior to its entry into the shelf region. There was an intensification of the current during prevailing westerly winds and a suppression of the current during sustained easterly winds. A change in wind direction (to easterly wind) such as occurred from August 13 to 19 was not sufficient to cause current

reversal even though the east wind lasted for more than 6 days. (Sims-ISWS)
W76-03853

SUSPENDED SOLIDS IN WATER.
Office of Naval Research, Arlington, Va. Ocean Science and Technology Div.
Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, 1974. 320 p. Edited by R. J. Gibbs.

Descriptors: *Conferences, *Suspended solids, *Oceanography, *Oceans, On-site investigations, Sampling, Instrumentation, Analytical techniques, Measurement, Suspension, On-site tests, Sea water, Sediment transport, Turbidity.
Identifiers: Optical techniques, Scatterance meter, In situ measurements.

Symposium included formal presentation of papers and two half-day workshops. Papers were presented on principles of studying suspended material and its settling velocities, principles of optical techniques, nearshore studies, and offshore studies. The workshops discussions were directed toward the subjects of sampling and concentrating materials, and in situ instrumentation. (See W76-03877 thru W76-03895) (Humphreys-ISWS)
W76-03876

PRINCIPLES OF STUDYING SUSPENDED MATERIALS IN WATER,
Delaware Univ., Lewes. Coll. of Marine Studies.
R. J. Gibbs.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 3-15, 1974. 6 fig, 1 tab, 9 ref.

Descriptors: *Suspended solids, *Oceans, *Testing procedures, Analytical techniques, Instrumentation, Sampling, Measurement, On-site tests, Suspension, Water analysis, Methodology, Calibrations, Organic matter, Particle size, Particle shape, Turbidity.
Identifiers: *Optical techniques, *In situ measurements, Scatterance meter, Transmissometers, Optical scattering.

The sampling methods for large-volume sampling both at surface and at depth were discussed. The advantages and disadvantages of centrifuging and filtering were covered, along with practical considerations of the various types of molecular filters. Various aspects of light transmission and scattering methods and their instrumentation were evaluated. The importance of and difficulty of adequate calibration was covered briefly. It was concluded that with proper care and planning, suspended solids in water can be accurately studied either by direct sampling or by in situ instrumentation. Studies of suspended solid material have been successfully completed from high-concentration riverine and estuarine environments to the extremely low concentrations of the deep oceanic environment. (See also W76-03876) (Humphreys-ISWS)
W76-03877

STOKES' SETTLING AND CHEMICAL REACTIVITY OF SUSPENDED PARTICLES IN NATURAL WATERS,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
A. Lerman, D. Lal, and M. F. Dacey.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 17-47, 1974. 8 fig, 1 tab, 49 ref.

Descriptors: *Suspended solids, *Settling velocity, *Reviews, Sea water, Lakes, Stokes law, Reynolds number, Stochastic processes, Model studies, Particle shape, Laboratory tests, Chemistry of precipitation, Chemical reactions, Turbidity.
Identifiers: *Dissolving particles, Axisymmetrical bodies.

Equations were given for the Stokes settling velocities of the following particle shapes: the sphere, oblate spheroid, prolate spheroid, circular cylinder, elliptic cylinder, disc, and hemispherical cap. Dissolution of calcareous and silicate particles settling through ocean water, based on literature data, was analyzed in terms of a model for dissolution rate independent of the particle surface area and a model for dissolution rate dependent on a surface reaction. The settling of dissolving particles in the presence of a countercurrent of upwelling water may lead to formation of thin nepheloid layers. Settling of calcite crystals through a stratified water column was treated as a case of variable nucleation (production) rates, dissolution and agglomeration of crystals en route to the bottom. A stochastic model presented gave a reasonably simple method for treating transient transport of particles in a physically heterogeneous water column. Use of the model requires knowledge of the physical and chemical characteristics of the system, such as the thermal structure of the water column, degree of turbulence, modes of change in particle size, and the structure of input, all of which may vary with the depth thereby affecting the values of transition probabilities that describe transport of a particle through the water column (See also W76-03876) . (Humphreys-ISWS)
W76-03878

BEAM TRANSMISSOMETERS FOR OCEANOGRAPHIC MEASUREMENTS,
Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
J. E. Tyler, R. W. Austin, and T. J. Petzold.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 51-59, 1974. 5 fig, 12 ref.

Descriptors: *Instrumentation, *Oceanography, *Reviews, *Suspended solids, Theoretical analysis, Measurement, Water, Sea water, Refractivity, Light, Optical properties, Water properties, Sampling, Turbidity.
Identifiers: *Optical techniques, *Beam transmissometers, *Optical measurements, Particle concentration.

The theoretical basis for the measurement of the beam transmittance of water was reviewed. Existing data for the beam transmittance of clean and distilled water were compared to demonstrate the current state of knowledge regarding the beam transmittance of clean water. Several recent instruments of sophisticated design were briefly described and data were given for surface particle concentration. (See also W76-03876) (Humphreys-ISWS)
W76-03879

VOLUME-SCATTERING FUNCTIONS IN OCEAN WATERS,
Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
R. C. Smith, R. W. Austin, and T. J. Petzold.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 61-72, 1974. 3 fig, 1 tab, 20 ref.

Descriptors: *Suspended solids, *Instrumentation, *Sampling, *Oceanography, Measurement, Particle shape, Particle size, Turbidity, Analysis, Sea water, Refractivity, Optical properties.
Identifiers: *Optical techniques, Volume-scatt ing function, In situ measurements.

Absolute values of the volume-scattering functi obtained in situ for a variety of natural oc waters, were presented. The use of opti techniques to infer the concentration, opti characteristics, and size distribution of suspen particulate material in the ocean was outlined. T technique of using single-angle scatter meters estimate the total volume-scattering function (hence the suspended particle concentration) discussed and an optimization of the techniq based upon the data presented, was suggest The optical signature of the suspended materia a water mass has not yet been fully exploited. achieve an optimization of information by opt methods one must compare data obtained in field and in the laboratory using absolu calibrated instruments, with computer simul theoretical models of particle characteristics. information on only the effective projected concentration of the suspended particles, a sin angle scattering instrument can be used. Howe it is impossible to distinguish between a chang the concentration by using the effective proje area and a change in the shape of the size distr tion from a single-angle instrument that meas only relative values. (See also W76-03 (Humphreys-ISWS)
W76-03880

MIE-THEORY MODELS OF LIGHT SCATT ING BY OCEAN PARTICULATES,
Miami Univ., Coral Gables, Fla. Dept. of Phys
H. R. Gordon.
In: Suspended Solids in Water; Marine Scie Volume 4, Proceedings of symposium Suspended Solids in Water, Santa Barb California, March 20-22, 1973. Plenum Press, York, New York, p 73-86, 1974. 8 fig, 2 tab, 11

Descriptors: *Suspended solids, *Turbidity, water, Particle size, Distribution patterns, Re tivity, Analysis, Analytical techniques, Dist tion, Mathematical models, On-site data c tions.
Identifiers: *Sargasso Sea, *Bahama Islands, theory, Volume scattering function, Light sc ing.

The general application of Mie theory to the of the volume-scattering function, VSF, oceanic particles was discussed in detail. bination of Coulter counter measurements an theory was examined in order to enhance derstanding of the size-refractive index dis tions of the sea water particles. Single-comp models (one scattering species) were exa and compared with the Sargasso Sea VSF. models yielded an average refractive index m tive to water. The meaning of m required t vestigation of simple two-component models sisting of low-index organic particles, and index inorganics. These models were syste cally studied and resulted (for the Sargasso S the conclusion that the inorganic particles o large size ranges while the organic particl confined to small sizes. Similar studies in th gue of the Ocean in the Bahama Islands ind the necessity of three-component models, place organic particles in small and large and inorganic particles in midsizes. This predicts a VSF in good agreement with ob tion, and indicates that most of the scatte due to the inorganic particles. with the larg organic particles (phytoplankton) contri only at small angles. A simple method for mination of the average refractive index of cles was presented and its limitations discussed in detail. (See also W76- (Humphreys-ISWS)
W76-03881

ATIAL DISTRIBUTION OF THE INDEX OF FRACTION OF SUSPENDED MATTER IN E OCEAN,
gon State Univ., Corvallis. School of Oceanogy.
V. Zaneveld.
Suspended Solids in Water; Marine Science, ume 4, Proceedings of symposium on pended Solids in Water, Santa Barbara, fornia, March 20-22, 1973. Plenum Press, New k, New York, p 87-100, 1974. 12 fig, 10 ref.

criptors: *Suspended solids, *Sea water, fractivity, *Oregon, *Optical properties, ific Ocean, Spatial distributions, On-site igations, Coasts, Oceans, On-site data collec-, Analysis, Analytical techniques, Distribu- Particle size, Mathematical studies, Light.
tifiers: *Galapagos Islands, Particle concen-on.

use of the index of refraction of suspended cles as a tracer of water masses and for the sis of the composition of particulate matter discussed. A method for determining the of refraction of suspended particles was nted. In order to determine an index of ction for a sample, the ratio of light scattered degrees for two wavelengths and the particle-listribution must be known. By using a ratio, fficult problem of determining absolute scat- values was avoided. In order to evaluate the of refraction as an oceanic paramter, two y different oceanic areas - the Oregon coastal nd the Equatorial Pacific near the Galapagos ls - were examined. The spatial distribution index of refraction in these areas was stu- n relation to ocean dynamics and to the na- f the suspended material. The limitations and tages of using the index of refraction of nded particles as an oceanic parameter were ted. The method currently using shows suf- differentiation between type of particles to eful in coastal environments. In open-ocean ons the particulate matter is much more m and more accurate methods must be ped if the index of refraction is to be used as an effective tracer. (See also W76-03876) hreys-ISWS)
3882

LUTE CALIBRATION OF A SCAT-NCE METER,
A and M Univ., College Station. Dept. of s.
ry.
spended Solids in Water; Marine Science, e 4, Proceedings of symposium on ded Solids in Water, Santa Barbara, nia, March 20-22, 1973. Plenum Press, New New York, p 101-109, 1974. 3 fig, 8 ref.

tors: *Calibrations, *Instrumentation, ctivity, *Suspended solids, Measurement, ter, Water, Theoretical analysis, Mathe- studies, Analysis, Analytical techniques, h equipment, Optical properties, Testing res.
ers: *Ligh scatterance meter, Volume scat-nction, Light scattering.

nethod has been developed for determining lute calibration of a light-scattering meter. hod is applicable when the light source is a limated beam of small diamter, such as laser. No special reflectance or trans- standards are required and the method is o implement. The measured calibration cludes refractive effects at water/glass/air es as well as the changes in scattering with scattering angle. Accuracy in the on is determined largely by the signal to d the drift in the instrumentation. Due to al coherence of the laser beam, there will le noise superimposed on the calibration s. When this is a problem, it is easily ed by oscillating the screen in its plane with a small amplitude (on the order of 1 mm). (See also W76-03876) (Humphreys-ISWS)
W76-03883

EFFECTS OF TROPICAL STORM AGNES ON THE SUSPENDED SOLIDS OF THE NORTHERN CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 113-132, 1974. 13 fig, 17 ref. NSF GA-36091.

Descriptors: *Suspended solids, *Chesapeake Bay, *On-site investigations, On-site data collections, Salinity, Estuaries, Hurricanes, Hydrologic aspects, Spatial distribution, Flood flow, Streamflow, Discharge(Water), Sediment discharge.
Identifiers: *Susquehanna River, Tropical storm Agnes.

During the spring freshet, the Susquehanna River overpowers the characteristic net non-tidal estuarine circulation in the upper 20-30 km of the estuary and the net flow and sediment transport are seaward at all depths. With subsiding river flow, the net non-tidal estuarine circulation is re-established in the upper reaches of the bay and a turbidity maximum is formed near the head of the estuary. The passage of tropical storm Agnes in June 1972, resulted in record flooding throughout the drainage basin of the northern Chesapeake Bay. On June 24, the day the Susquehanna crested at its mouth, the instantaneous peak flow exceeded 32,000 cu m/sec. The daily average discharge of 27.750 cu m/sec for that day exceeded the previous daily average high by nearly 33 percent. Throughout the bay, salinities were reduced to levels lower than any previously observed. On June 26, 1972, salinities were less than 0.5% from surface to bottom throughout the upper 60 km of the bay, and the surface salinity was less than 1% in the upper 125 km of the bay. Salinities remained low throughout most of the summer, but had nearly recovered to normal levels by September. On June 24, the concentration of suspended solids at the mouth of the Susquehanna River exceeded 10,000 mg/l and, in a one-week period, the sediment discharge exceeded that of the past several decades. The bulk of this sediment was deposited in the upper 40 km of the bay. (See also W76-03876) (Humphreys-ISWS)
W76-03884

DISTRIBUTION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN SUBMARINE CANYONS OFF SOUTHERN CALIFORNIA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.; and National Oceanic and Atmospheric Administration, Miami Fla. Marine Geology and Geophysics Lab.
D. E. Drake.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 133-153, 1974. 12 fig, 2 tab, 34 ref. NSF GB-8206 and GA-22842.

Descriptors: *Suspended solids, *California, *Submarine canyons, *On-site investigations, Oceans, Continental shelf, Sediment transport, Turbidity currents, Sea water, Water temperature, Refractivity, Currents(Water), Sediment distribution, Distribution patterns, Turbidity, Profiles.
Identifiers: Nepheloid layers.

Studies of the distribution of suspended particulate matter in submarine canyons off southern California were reported. Simultaneously collected light beam transmission and salinity/temperature data demonstrated an association of particule maxima with the relatively steep segments of the vertical, water-density gradient over shelf, slope, and canyon environments. Within the submarine canyons that cut the mainland shelf, mid-water particle maxima contain high percentages of terrigenous detritus supplied by seaward flow from canyon nepheloid layers. The concentrations of particulate matter in the canyon nepheloid layers rarely, if ever, exceed 10 mg/l even in areas close to major rivers; typical peak values in the canyon heads are 3 to 6 mg/l. It was concluded that turbid-layer, density-excess underflows are not possible at these low concentrations. Bottom currents in the Santa Cruz Canyon are vigorous and show a net downcanyon flow that is far too strong to be explained by turbid-layer flow. While submarine canyons off souther California are an important pathway forfine sediment leaving the shelf, it is likely that no more than 10-15% of the annual terrigenous supply moves to deeper water by way of the canyon. (See also W76-03876) (Humphreys-ISWS)
W76-03885

CONTINUOUS LIGHT-SCATTERING PROFILES AND SUSPENDED MATTER OVER NITINAT DEEP-SEA FAN,
Washington Univ., Seattle. Dept. of Oceanogrphy.
E. T. Baker, R. W. Sternberg, and D. A. McManus.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 155-172, 1974. 11 fig, 17 ref.

Descriptors: *Suspended solids, *Refractivity, *Washington, *Continental slope, Submarine canyons, On-site investigations, On-site data collections, Instrumentation, Sea water, Oceans, Sampling, Turbidity, Particle size, Distribution, Calibrations, Profiles, Sedimentation rates.
Identifiers: *Nitinat Deep Sea Fan, Nephelometer, Nepheloid layer, Light scattering.

During September 1971 and June 1972, a total of 65 light-scattering profiles were continuously recorded in the waters over Nitinat Fan with a nephelometer. All profiles extended from the sea surface to a point 20 m above the sea floor (maximum depth 2400 m) and as many as 5 prominent scattering layers were observed within the water column at a given station. These profiles described an evidently permanent and geographically continuous bottom nepheloid layer (BNL). This layer was thinner than that found in many of the deep-ocean basins, ranging between about 50 and 300 m. Scattering intensities at the base of the BNL correlated well with the varations in thickness, creating a relatively consistent picture in which the thickest and most intense portions of the BNL occupy the topographic lows (the northwestern flank and Cascadia Valley) leaving the levees and bordering marginal ridge covered by only a relatively thin and weak scattering layer. Estimates of the amount of inorganic sediment which was suspended within this layer were made on the basis of 24 samples of particulate matter collected simultaneously in situ with the nephelometer readings. The average value for the mass of inorganic sediment contained in a 1 sq cm column of water within the BNL was about 0.5 mg. To sustain the net sedimentation rate recorded in Nitinat Fan over the last 9000 years, these particles must have a residence time of only about 1 month in the BNL. (See also W76-03876) (Humphreys-ISWS)
W76-03886

PHYSICAL, CHEMICAL, AND OPTICAL MEASURES OF SUSPENDED-PARTICLE CONCENTRATIONS: THEIR INTERCOMPARISONS

AND APPLICATION TO THE WEST AFRICAN SHELF,
University of South Florida, St. Petersburg. Dept. of Marine Science.
K. L. Carder, P. R. Betzer, and D. W. Eggimann.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 173-193, 1974. 7 fig, 2 tab, 37 ref. ONR N00014-72-0363-0001.

Descriptors: *Suspended solids, *Continental shelf, *Africa, *Particle size, Properties, *Atlantic Ocean, Sea water, Oceans, On-site investigations, Sampling, Salinity, Measurement, Instrumentation, Laboratory tests, Physical properties, Density, Refractivity, Analysis, Surveys.
Identifiers: *West African shelf, Sierra Leone(Africa), Liberia(Africa), Light scattering, Nepheloid layers.

A property of oceanic particulate matter referred to as 'apparent density' was calculated by dividing the weight of suspended particular matter (SPM) by the volume of particles. This parameter is equal to 'mass density' for particles, such as minerals, containing little water. Apparent density calculations were made for a series of samples collected on R/V Trident cruise 112 to the continental shelves of Sierra Leone and Liberia. These values ranged from 0.104 to 1.79 for samples with particulate organic carbon fractions (POC/SPM) ranging from 0.486 to 0.037. Cross sections of salinity, light scattering beta (45), suspended particulate matter (SPM), and beta (45)/total surface area for this region of the west African shelf showed a northwestward-flowing bottom current laden with inorganic sediment having a high apparent density and s southeastward-flowing, organic-rich (low apparent density) surface current. Of the measures of particle concentration applied to these waters, SPM and beta (45) showed greatest correlation (r=0.960), suggesting that apparent density is highly correlated with the particle index of refraction. Total particulate volume and total particulate surface area data were not nearly as well correlated with either beta (45) or SPM; optical/physical theories were proposed to explain this phenomenon. (See also W76-03876) (Humphreys-ISWS)
W76-03887

THE DISTRIBUTION OF PARTICULATE MATTER IN A NORTHWEST AFRICAN COASTAL UPWELLING AREA,
Copenhagen Univ., Denmark. Inst. of Physical Oceanography.
G. Kullenberg.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 195-202, 1974. 6 fig, 1 tab, 11 ref.

Descriptors: *Suspended solids, *Coasts, *Africa, *Ocean circulation, *Atlantic ocean, Upwelling, Water, Sea water, Oceans, Salinity, Profiles, Water temperature, Distribution, On-site investigations, Analysis, On-site data collections, Tracking techniques, Topography, Biology, Chemistry, Surveys.
Identifiers: Light scattering.

The particle distribution in the upper 200 m of the upwelling area oceanward of the northwest Arican coast has been investigated, using an in-situ integrating light-scattering meter, with the two-fold purpose of relating to the general conditions in the area regarding circulation, topography, biology, and chemistry, and investigating the possibility of defining and tracing water masses in such an area by their particle content. It was shown that the particle distribution in an upwelling area can serve as an indicator of physical and other processes and that the particle content is a very distinct characteristic of a water mass. Of special interest was the inversion layer of high particle content found beneath the upwelling water. The high particle load of the bottom water on the slope indicated the presence of an eroding current. (See also W76-03876) (Humphreys-ISWS)
W76-03888

THE SUSPENDED MATERIAL OF THE AMAZON SHELF AND TROPICAL ATLANTIC OCEAN,
Delaware Univ., Lewes. Coll. of Marine Studies.
R. J. Gibbs.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 203-210, 1974. 6 fig, 3 ref. ONR N00014-67-A-0356-0011.

Descriptors: *Suspended solids, *Atlantic Ocean, *Tropical regions, *Continental shelf, *South America, Sediment transport, Distribution, Distribution patterns, Sea water, Sampling, Analysis, Turbidity, On-site investigations, Refractivity, Oceans.
Identifiers: *Amazon shelf.

Filtered samples and optical data from six cruises in the Atlantic Ocean off the Amazon River between 1963 and 1971 were used to determine transport of surface suspended material outward into the ocean. During high-river discharge the turbid-water line (equal to or greater than 2.0 mg/l) extends 100 km seaward from the river mouth and northwestward along the coast for about 2000 km in a zone averaging 60 km wide. During low-river discharge, a similar pattern extends seaward only 80 km from the river mouth and northwestward for about 2000 km. This turbid zone migrates between these extreme limits at intermediate stages of river discharge. The surface concentration of suspended material exhibits a steady seaward decrease and the zone along the outer continental shelf shows lobes of turbid water being engulfed by the northwestward flowing Guiana current. (See also W76-03876) (Humphreys-ISWS)
W76-03889

TURBIDITY DISTRIBUTION IN THE DEEP WATERS OF THE WESTERN ATLANTIC TROUGH,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
S. L. Eittreim, and M. Ewing.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspeneded Solids, in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 213-225, 1974. 4 fig, 19 ref. ONR N-00014-67-0108-0004, NSF GA27281.

Descriptors: *Suspended solids, *Turbidity, *Atlantic Ocean, *Distribution patterns, Submarine canyons, On-site investigations, Instrementation, Measurement, Sampling, Deep water, Analysis, Surveys.
Identifiers: *Atlantic trough, Nepheloid layer.

The 'background' turbidity (clearest water of the water column) was mapped in the western Atlantic using standardized nephelometer measurements taken on R/V Conrad cruises 15 and 16. This background was utilized as a reference turbidity to map features of the bottom-water turbidity using older unstandardized relative nephelometer profiles. Variations in background turbidity by a factor of 3 apparently reflect the pattern of biological productivity in the overlying surface waters: high background in an equatorial belt and in latitudes greater than the subtropical convergences, but low background in the temperature latitudes. The resulting distributions of near-bottom turbidity values showed a maximum in the southwestern Argentine Basin and a lesser maximum along the continental rise of the North American Basin. Bottom turbidity in the nepheloic layer decreases from both basins toward the equator and appears to be both a function of bottom current velocity and proximity to terrigenous sediment sources. (See also W76-03876) (Humphreys-ISWS)
W76-03890

VARIATIONS IN BENTHIC BOUNDARY LAYER PHENOMENA: NEPHELOID LAYER IN THE NORTH AMERICAN BASIN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
P. E. Biscaye, and S. L. Eittreim.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973. Plenum Press, New York, New York, p 227-260, 1974. 16 fig, 4 tab, 2 ref. ONR N00014-67-A-0108-0004, NSF GA27281, ERDA AT(11-1)3132.

Descriptors: *Suspended solids, *Turbidity, *Atlantic Ocean, *Distribution patterns, Survey, On-site investigations, Sea water, Oceans, Sampling, Profiles, Water temperature, Boundary layers, Instrumentation, Measurement, Analysis, Testing procedures, Currents(Water), Density currents, Salinity, Refractivity.
Identifiers: *Blake-Bahama Outer Ridge, *Hatteras Abyssal Plain, *North American Basin, Excess-radon, Nepheloid layer.

Observations of phenomena associated with benthic boundary layer were made over a 19-d period in two different regimes in the weste North American Basin. Repeated measuremen of temperature, in situ and in vitro turbidit suspended particulate concentrations and exce radon versus depth, as well as bottom phot graphs, were made as a function of time at two l cations on the lower slope of the Blake-Baha Outer Ridge (BBOR) and at one location on t Hatteras Abyssal Plain (HAP). At the BBOR si the benthic boundary layer was manifest by hi concentrations of suspended particulates, high t bidity, and intense vertical mixing indicated by e cess radon. Vertical distributions of particula matter and radon were related to the thermal str ture of the water mass, and the strongest manif tations of frictional interaction between the wa and bottom were seen below 150-300 m. At t HAP site, manifestations of the benthic bounda layer were less intense, less variable and restrict to a thinner layer. Turbidity and concentration particulate matter were much lower than on t BBOR and vertical mixing measured by exc radon was an order of magnitude lower. De profiles of these parameters showed the strong evidence of the benthic boundary layer to restricted to 80-100 m above the bottom. hypothesis to explain the variations observed the BBOR was presented in which eddies of A tarctic Bottom Water are injected into the m turbid, rapidly southward flowing Western Bo dary Undercurrent north of the study area. (also W76-03876) (Humphreys-ISWS)
W76-03891

DISTRIBUTION OF SUSPENDED PARTICL IN THE EQUATORIAL PACIFIC OCEAN,
Oregon State Univ., Corvallis. School of Ocean raphy.
H. Pak.
In: Suspended Solids in Water; Marine Scien Volume 4, Proceedings of symposium Suspended Solids in Water, Santa Barb California, March 20-22, 1973. Plenum Press, N York, New York, p 261-270, 1974. 6 fig, 24 ONR N00014-67-A-0369-0007.

Descriptors: *Suspended solids, *Pacific Oc *Spatial distribution, Particle size, Oceans, water, Water temperature, Dissolved oxy Analysis, On-site data collections, Refracti Surveys.
Identifiers: *Panama Basin, Light scattering.

bt scattering, size distribution of the suspended ticles and standard hydrographic parameters e measured on water samples collected at 152 ions in the Panama Basin during October and vember 1971. The particle-volume concentra- s were calculated by fitting the measured parti- size distributions to the exponential distribu- and integrating the exponential distribution. l suspended matter was calculated using a par- density of 2.2 mg/ml. The suspended matter in water below 25 m depth ranges from 0.04 mg/l 092 mg/l and from 0.11 to 1.76 mg/l in the sea ace. The spatial distribution of the suspended er appears to be closely related to the dynamic litions of the water: the equatorial front, in- ction of the Cromwell Current and the pagos Islands, and interaction of bottom cur- against the Carnegie Ridge. (See also W76- 6) (Humphreys-ISWS)
-03892

PENDED MATTER AND THE STABILITY THE WATER COLUMN: CENTRAL CARIB- N SEA,
s A and M Univ., College Station. Dept. of nography.
Bassin.
uspended Solids in Water; Marine Science, me 4, Proceedings of symposium on ended Solids in Water, Santa Barbara, rnia, March 20-22, 1973. Plenum Press, New New York, p 271-279, 1974. 4 fig, 20 ref. N00014-68-A-0308-0002.

iptors: *Suspended solids, *Sea water, ial distribution, On-site data collections, On- nvestigations, Oceans, Analysis, Analytical ques, Salinity, Water temperature, Stability. fiers: *Caribbean Sea, Total suspended r, Nepheloid layer, Water column.

suspended matter, TSM, was measured in ter column at 4 stations in the central Carib- Sea in relationship to the vertical profile of stability. It was postulated that the several naxima at depth are associated with zones of rbulence, and the near-bottom nepheloid bserved in many areas of the world ocean is tion of a near-bottom density increase cou- ith a bottom shear capable of suspending diment. The absence of one or both of these explains the reported lack of a nepheloid n the Caribbean. Future work should con- ontinuous vertical profiling by means of in- D records and nephelometry in order to ex- the small-scale effect of stability on ded particulates and to rigorously quantify relationships. (See also W76-03876) hreys-ISWS)
3893

-SCATTERING MEASUREMENTS AND ICAL ANALYSIS OF SUSPENDED ER IN THE NEAR-BOTTOM NEPHE- AYER OF THE GULF OF MEXICO,
A and M Univ., College Station. Dept. of graphy.
eely, L. Sullivan, and W. M. Sackett.
pended Solids in Water; Marine Science, 4, Proceedings of symposium on ded Solids in Water, Santa Barbara, ia, March 20-22, 1973. Plenum Press, New New York, p 281-293, 1974. 7 fig, 1 tab, 27 R N00014-68-A-0308-0002, ONR N00014- 0004, NSF GA-27281.

tors: *Suspended solids, *Gulf of Mexico, s, On-site investigations, On-site data col- Sea water, Oceans, Profiles, Sampling, al techniques, Analysis, Instrumentation, procedures, Distribution, Chemical analy- ninum, Iron, Organic matter, Carbon. rs: *Caribbean Sea, *Nepheloid layer, ttering, Silicone.

The mass and chemical composition of suspended material in three near-bottom profiles in the Gulf of Mexico and in one profile in the Caribbean showed a definite relationship to light scattering as measured by an Ewing-Thorndike nephelometer. For the Gulf of Mexico profiles, an increase in light scattering from about 300-700 m above the bottom indicated a near-bottom nepheloid layer. In this layer, at about 100-200 m above the bottom the concentrations of particulate aluminum, silicon, iron and organic carbon generally increased from 2 to 6 times over their respective concentrations at mid-depth. Constant and low light-scattering values and suspended matter concentrations at one station indicated that no near-bottom nepheloid layer was found in the Yucatan Basin of the Caribbean. (See also W76-03876) (Humphreys-ISWS)
W76-03894

LIGHT SCATTERING AND SUSPENDED PARTICULATE MATTER ON A TRANSECT OF THE ATLANTIC OCEAN AT 11 DEG N,
University of South Florida, St. Petersburg. Dept. of Marine Science.
P. R. Betzer, K. L. Carder, and D. W. Eggimann.
In: Suspended Solids in Water; Marine Science, Volume 4, Proceedings of symposium on Suspended Solids in Water, Santa Barbara, California, March 20-22, 1973, Plenum Press, New York, New York, p 295-314, 1974. 7 fig, 2 tab, 34 ref. ONR N00014-72-A-0363-0001.

Descriptors: *Suspended solids, *Atlantic Ocean, *Surveys, On-site investigations, On-site data collections, Sampling, Sea water, Water temperature, Chemical properties, Physical properties, Testing procedures, Analytical techniques, Distribution, Profiles, Organic matter, Carbonates.
Identifiers: *Nepheloid layer, Light scattering.

A combined investigation of the optical, physical and chemical properties was carried out on the suspended particulate matter on a transect of the North Atlantic Ocean at about 11 deg N. A nepheloid layer approximately 100 m thick was found at near-bottom in the western basin of the North Atlantic; no evidence of a near-bottom nepheloid layer was found in the eastern basin. Increases in suspended particulate matter and absolute light scattering occurred between 3000 and 4000 m at 2 stations near South America. At 2 stations over the Mid-Atlantic Ridge, large (30-40%) increases in the mass suspended particulate matter occurred 30 m above the bottom. Particulate organic carbon and particulate carbonate determinations indicated these increases are due to greater amounts of refractory oxides and/or hydroxide in the suspended matter and may represent an injection or diffusion of materials from the ridge to deep ocean waters. Samples taken in Subtropic Underwater, oxygen minimum water and Antarctic Intermediate Water showed relatively low amounts of suspended particulate matter and absolute light scattering, indicating that the nepheloid character reported for these water masses in the northwestern Caribbean and Yucatan Channel must be acquired in transit through the Caribbean Sea. Near-bottom nepheloid layers were found at four stations along a 240 km stretch of the African continental rise. (See also W76-03876) (Humphreys-ISWS)
W76-03895

WATER QUALITY IN RHODE RIVER AT SMITHSONIAN INSTITUTION PIER NEAR ANNAPOLIS, MARYLAND, APRIL 1970 THROUGH DECEMBER 1973,
Geological Survey, Edgewater, Md. Chesapeake Bay Center.
For primary bibliographic entry see Field 5A.
W76-03914

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PROCESS AND INSTALLATION FOR THE TREATMENT OF WATER AND OTHER LIQUIDS,
Abwassertechnik und Kunst stoffbau GmbH, Waiblingen (East Germany). (Assignee).
H. Weiss.
U S Patent No 3,920,544, 7 p, 1 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 940, No 3, p 1368, November 18, 1975.

Descriptors: *Patents, *Desalination, *Demineralization, *Water purification, *Water treatment, *Ion exchange, Resins, Separation techniques, Desalination processes, Desalination apparatus.
Identifiers: Resinous-bed ion exchanger.

A process and installation for the treatment, particularly softening, partially or fully desalting water, aqueous solutions, acids and the like, is described in which the liquid being treated is conducted in resinous-bed ion exchanger. The liquid is conducted at a vertical motion component from above downward into the inflow end, and with a vertical motion component from the bottom upwardly out of the outflow end of the resinous-bed ion exchanger. The charges during the liquid treatment are removed from the bed at its outflow end and re-entrained at its inflow end. Due to the cyclic withdrawal of charges of the ion exchanger resin at the outflow end at an upward directed outflow, there is achieved the required loosening of the ion exchanger bed for the undisturbed operation of the process and the possibility of continual withdrawal of pure water during the partial regeneration of the resin. Electronic control devices may be largely dispensed with, since for the particular needs it is sufficient to employ relatively simple measuring apparatus for functional control. Each time the lengthiest loaded ion exchanger charge is withdrawn from the bed and regenerated. This periodically regenerated exchanger charge is then re-entrained in the bed at the water inflow side, so that the inflowing water constantly flows through a fully exchangeable ion exchanger. The filtering up from below affords a 100% utilization of the total ion exchanger bed while avoiding danger of deposit strand formations on the bed. (Sinha-OEIS)
W76-03515

WATER DISTILLATION IN THE TURKMEN SSR AND THE UZBEK SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
M. V. Kolodin.
Probl Osvoeniya Pstyn', 4, 65-70, 1974.

Descriptors: *Distillation, *Pilot plants, *Industrial plants, Desalination.
Identifiers: Turkmen-SSR, *USSR, Uzbek-SSR.

A chronological description is presented of research on water distillation and erection of pilot and industrial distilling installations in both USSR republics.--Copyright 1975, Biological Abstracts, Inc.
W76-03697

RELATIVE TRANSPORT RATES OF ALAKLI ION ACROSS CELLULOSE ACETATE MEMBRANES,
California Univ., Los Angeles. School of Engineering and Applied Science.
W. G. Sunu, and D. N. Bennion.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 193, $5.00 in paper copy, $2.25 in microfiche. California

Water Resources Center, Desalination Report No 61, UCLAcENG-7543, June 1975. 87 p, 14 fig, 12 tab, 50 ref, append.

Descriptors: *Desalination, *Ion transport, Membrane, *Membrane processes, *Alkalis(Bases), Cations, Ions, Ion exchange.
Identifiers: Cellulose acetate membranes.

The salt transport parameter Le, the water transport parameter Lo, and the cation transference number t to the +m power in asymmetric cellulose acetate membranes cured at 77C, 85C, and 93C have been measured for alkali chloride solutions. The relative effective transport mobilities, defined by the product of the transport parameter Le with the transference number t to the +m power have the following trends K+ > Rb+ > Cs+ > Na+ > Li+ loose membrane (77C), K+ > Rb+ > Cs+ > Na+ > Li+ medium membrane (85C), Rb+ > K+ > Cs+ > Na+ > Li+ tight membrane (93C). The sequences observed for loose and medium membranes are explained by a thermostatic model. For a tight membrane the ribidium ion becomes the most mobile. This sequence shift is explained by an interpretation which indicates that the relative transport rates of ions are controlled by the ion-site interactions and by the hydration energies of ions in the solution phase and in the membrane phase. (Snyder-Calif, Davis)
W76-03960

RECLAMATION OF HYPERION SECONDARY EFFLUENT BY REVERSE OSMOSIS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 5D.
W76-03961

3B. Water Yield Improvement

CONTROLLING EVAPORATION OF WATER,
Nalco Chemical Co., Chicago, Ill. (Assignee).
J. F. Vartiak.
US Patent No 3,918,904, 2 p, 5 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 839, November 11, 1975.

Descriptors: *Patents, *Evaporation control, *Chemcontrol, Bodies of water, Water conservation, Polymers.
Identifiers: Evaporation rates, Water-soluble vinyl addition polymers.

Evaporation of water is retarded at a predetermined rate by the addition of a water-soluble vinyl addition polymer to a body of water. The polymer is in a water dissolved state since in that form it is easily dispersed throughout the water system and it is in the form of acrylamide sodium acrylate copolymer. (Sinha-OEIS)
W76-03506

SNOWMELT RUNOFF EFFICIENCIES ON ARIZONA WATERSHEDS,
Forest Service (USDA), Silver City, N. Mex. Gila National Forest.
R. M. Solomon, P. F. Ffolliott, M. B. Baker, G. J. Gottfried, Jr., and J. R. Thompson.
Arizona University Agriculture Experiment Station, (Tucson), Research Report 274, 50 p, 1975. 1 tab.

Descriptors: *Watersheds(Basins), *Snowmelt, *Runoff, *Arizona, Water yield, Snowpacks, Precipitation(Atmospheric), Equations, Regression analysis, Watershed management, Water yield improvement.

This report documents snowmelt runoff efficiencies for several experimental watersheds in different vegetation zones throughout those parts of Arizona where snowmelt water yield is a significant contributor to the annual water yield budget. Tentative regression equations were developed relating snowpack runoff efficiencies to inventory-predicting variables. Timing of precipitation throughout the snowpack accumulation-melt period is of importance in establishing the snowmelt runoff efficiency value. (Witt-IPC)
W76-03581

MECHANIZATION OF WATER-RAISING FROM THE WATER-ACCUMULATING WELLS 'CHIRLE', (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Research Inst. of Agriculture.
For primary bibliographic entry see Field 4B.
W76-03663

DETERMINING THE POWER LEVEL AND RANGE OF SOLAR WATER-RAISING INSTALLATIONS IN THE TURKMEN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W76-03664

WATER AVAILABILITY FOR IN-STREAM FLOWS: SNAKE RIVER, SWAN FALLS-HELLS CANYON DAM.
Idaho Water Resource Board, Boise.
For primary bibliographic entry see Field 4A.
W76-03722

THE FUTURE OF WATER RESOURCES IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6D.
W76-03755

THE CONSTRUCTION AND OPERATION OF GRAVEL WELL SOURCES WITH PARTICULAR REFERENCE TO THOSE OF THE NENE AND OUSE WATER BOARD,
H. B. Wilson.
Journal of the Institution of Water Engineers and Scientists, Vol 29, No 3, p 123-128, May, 1975. 4 fig, 2 tab, 7 ref.

Descriptors: *Water supply, *Wells, *Water management(Applied), (Water treatment, Rivers, Construction costs, Odor, Water quality, Filtration, Aquifers, Groundwater.
Identifiers: Gravel wells, Great Britain.

As part of water resources management planning in Great Britain, the potential use of gravel well sources for water supply has been investigated. With an increasing water demand and the length of time and/or costs of cleaning up rivers, gravel wells may be a useful source for small water supplies. Problems connected with sites and well construction in the Nene and Ouse Water Board area were discussed. It was found that the yield of gravel well sources varies in Great Britain from 0.1 to 5.0 mgd depending upon the extent and depth of gravel deposits (which are dependent on the size of river flowing through them). The possibility of combining gravel and river water may be used to give a total required quantity. The quality of water obtained from gravel wells was generally good, with no taste or odor problems. Water quality deterioration may occur when sites are flooded; this may be overcome by a single stage of filtration. Also, abstraction can continue at times when other aquifers would be over pumped. (Kramer-FIRL)
W76-03817

THE ECONOMICS OF GEOTHERMAL RESOURCES IN THE IMPERIAL VALLEY: A PRELIMINARY ANALYSIS,
California Univ., Riverside. Graduate School of Administration.
For primary bibliographic entry see Field 3E.
W76-03959

HYDROLOGIC RELATIONS ON UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.
For primary bibliographic entry see Field 2A.
W76-03967

3C. Use Of Water Of Impaired Quality

WASTEWATER USE IN THE PRODUCTION OF FOOD AND FIBER--PROCEEDINGS.
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 5D.
W76-03541

REVIEW OF AMERICAN PUBLIC WORKS ASSOCIATION STUDY OF FACILITIES UTILIZING LAND APPLICATION OF WASTEWATER,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-03542

WASTEWATER UTILIZATION IN INTEGRATED AQUACULTURE AND AGRICULTURE SYSTEMS,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
For primary bibliographic entry see Field 5D.
W76-03543

MORBIDITY RISK FACTORS FROM SPRAY IRRIGATION WITH TREATED WASTEWATERS,
Texas Univ., Houston. School of Public Health.
For primary bibliographic entry see Field 5C.
W76-03546

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. I. MONITORING DURING PILOT OPERATION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-03547

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. II. DEVELOPMENT OF GUIDELINES BY METHOD OF ALTERNATIONS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-03548

REPORT ON PILOT AQUACULTURE SYSTEM USING DOMESTIC WASTEWATERS FOR REARING PACIFIC SALMON SMOLTS,
Humboldt State Univ., Arcata, Calif. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W76-03553

AN EXPERIMENT IN THE EUTROPHICATION OF TERRESTRIAL ECOSYSTEMS WITH SEWAGE: EVIDENCE OF NITRIFICATION IN A LATE SUCCESSIONAL FOREST,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 5C.
W76-03555

IRRIGATION WITH WASTEWATER AT BAKERSFIELD, CALIFORNIA,
Metcalf and Eddy, Inc., Palo Alto, Calif.

Crites.
astewater Use in the Production of Food and
– Proceedings, March 5-7, 1974, Oklahoma
Oklahoma, p 229-239. 1 fig, 10 ref, 4 tab.

iptors: *Irrigation, *Crops, *Sewage ef-
s, California, Barley, Alfalfa, Corn(Field),
n, Pastures, Forages, Waste water disposal,
pollution control, History, Operations, En-
nental effects, Irrigation practices, Soil pro-
s, Water pollution sources, Groundwater,
es, Irrigation effects, Fertilizers.
iers: Bakersfield(Calif), San Joaquin Val-
lif).

water from the city's effluent treatment
as been used to irrigate cropland in the
n end of the San Joaquin Valley in Califor-
more than 60 years. This paper documents
ncipal features of this successful operation
cing its historical development, current
on, and environmental effects. Irrigation
gricultural practices are discussed in-
lly for alfalfa, barley, corn, cotton, and
grass. Crop yields vary from slightly below
) to well above (corn) the county-wide
. These yields are greatly affected by the
racteristics as well as the effluent charac-
s. A claim that the irrigation operation is
inating the groundwater with nitrates has
en substantiated. (See also W76-03541)
PC)
556

**CATTLE FEEDLOT RUNOFF IN CROP
CTION,**
State Univ., Manhattan.
allingford, L. S. Murphy, W. L. Powers,
anges, and L. A. Schmid.
tewater Use in the Production of Food and
Proceedings, March 5-7, 1974, Oklahoma
lahoma, p 273-294. 11 fig, 10 ref, 3 tab.

ors: *Feed lots, Runoff, *Crop produc-
rigation water, Corn(Field), Plant growth,
mical properties, Kansas, Salts, Ammoni-
s, Sodium compounds, Potassium com-
Electrical conductance, Nitrates,
, Nitrogen compounds, Phosphorus com-
Nutrients, Water pollution control, Water
sources, *Farm wastes, Disposal, Waste
Irrigation, Lagoons, Effluents, Waste
posal, Agricultural runoff.

cts of irrigation with beef cattle feedlot-
ater on the growth and composition of
mays) forage and on chemical properties
sas soil were investigated. The lagoon
tains large amounts of salts, particularly
nt cations (ammonium, potassium, and
Continued applications of lagoon water
the salt content of the soil. Increases in
ical conductivity of the soil were linearly
the amount of lagoon water applied. The
lagoon-water treatments contributed
than could be utilized by corn plants or
to the lower portions of the soil profile.
trogen accumulated in the soil from the
7 cm/year lagoon water applications
the relatively high nitrogen content of
ter. Phosphorus also accumulated with
ter applications but accumulations were
stricted to the surface 20 cm, reflecting
vement of phosphorus in the soil. Max-
ds of corn forage occurred at an average
rate of 13 cm/year after the second and
and at 22 cm/year after the fourth year.
rates, yields declined. Maximum
tes of applied nutrients were achieved
e application rates that produced max-
ds. (See also W76-03541) (Witt-IPC)

**ON OF TREES AND CROPS WITH
STABILIZATION POND EFFLUENT
ERN MICHIGAN,**
d Works, Grand Rapids, Mich.

For primary bibliographic entry see Field 5C.
W76-03560

LEGAL CONSTRAINTS ON THE USE OF WASTEWATER FOR FOOD AND FIBER,
Virginia Polytechnic Inst. and State Univ., Blackburg. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W76-03562

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 6B.
W76-03563

THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROGRAM,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5D.
W76-03565

MINERAL QUALITY OF FISH POND EFFLUENT RELATED TO SOIL PROPERTIES AND CROP PRODUCTION,
Arkansas Univ., Fayetteville.
L. H. Hileman.
In: Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 412-416. 2 tab.

Descriptors: Fish hatcheries, *Effluents, *Mineralogy, *Crop production, *Irrigation water, *Soil properties, Calcium compounds, Bicarbonates, Magnesium compounds, Sodium compounds, Salts, Dissolved solids, Catfishes, Plant growth, Water pollution sources, Water pollution control, Waste disposal, Water quality, Soil chemical properties, Soil physical properties, Soil disposal fields, Nutrients.

Irrigation water quality is determined by the kind and amount of mineral elements present in the water, and the relationship of these elements to the soil's chemical and physical properties as they affect both immediate and future crop production. Data are presented showing the calcium, magnesium, sodium, bicarbonate, total dissolved salt, sodium adsorption ratio, and soluble sodium percentage (soluble sodium as a percent of the total soluble cations, Ca, Mg, Na, K) in catfish pond waste water, and their potential effects on the soil and plant growth are discussed. Indescriminate use of these waters can result in the alteration of plant nutrient uptake, therby altering plant quality, reducing crop yields, and changing soil physical and chemical properties. Farmers planning to use catfish waste water for irrigation should obtain a chemical analysis and irrigation quality evaluation before applying it to soils. (See also W76-03541) (Witt-IPC)
W76-03569

CRITICAL VARIABLES IN FOOD-ITEM POPULATION DYNAMICS IN A WASTE-WATER AQUACULTURE SYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
J. E. Powers.
In: Wastewater Use in the Production of Food and Fiber--roceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 497-503. 3 fig, 5 ref, 2 tab.

Descriptors: *Aquiculture, *Salmon, *Amphipoda, *Sewage effluents, Food chains, Simulation analysis, Water pollution control, Water pollution treatment, Salinity, Water properties, Sea water, Growth rate, Animal growth, Temperature, Economics, California, Time lag, Fish food organisms, Fish, Smolt, Aquatic animals.

Identifiers: Humboldt Bay(Calif), Oncorhynchus kisutch, Anisogammarus confervicolus.

An aquaculture system fertilized by domestic sewage was constructed adjacent to Humboldt Bay, California, for use in rearing salmon (Oncorhynchus kisutch) to the smolt age, i.e., the age at which they migrate to the ocean. A simulation model showed that the lag time needed for attaining an adequate food source (in this case the gammarid amphipod, Anisogammarus confervicolus) can be reduced by first controlling the system variables (salinity) to promote rapid growth of the amphipods, and then converting the variables to levels optimal for the salmon. Salinity should initially be kept at 24 parts per thousand to maximize amphipod growth rate, and then lowered (by decreasing the proportion of seawater) to meet the physiological needs of the salmon. Temperature would affect growth rate as well, but temperature control is not economically feasible. (See also W76-03541) (Witt-IPC)
W76-03572

STANDING CROPS OF BENTHIC FAUNA IN MARINE AQUACULTURE PONDS USING RECLAIMED WATER,
Humboldt State Univ., Arcata, Calif.
For primary bibliographic entry see Field 5C.
W76-03574

TRITIUM FRACTIONATION IN PLANTS,
Environmental Monitoring and Support Lab., Las Vegas, Nev. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5A.
W76-03632

INFLUENCE OF TREATED MUNICIPAL WASTE WATER ON GROWTH, FIBER, ACID-SOLUBLE NUCLEOTIDES, PROTEIN, AND AMINO ACID CONTENT IN WHEAT GRAIN,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
For primary bibliographic entry see Field 5E.
W76-03690

DETACHMENT OF SOIL AGGREGATES BY SIMULATED RAINFALL FROM HEAVILY MANURED SOILS IN EASTERN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 2J.
W76-03730

NEEDED: A GROUND-WATER TREATY BETWEEN THE UNITED STATES AND MEXICO,
For primary bibliographic entry see Field 4B.
W76-03918

3E. Conservation In Industry

WASTEWATER USE IN THE PRODUCTION OF FOOD AND FIBER--PROCEEDINGS.
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 5D.
W76-03541

REUSE OF WATER IN THE PULP AND PAPER INDUSTRY,
Australian Paper Manufacturers Ltd., Melbourne (Australia).
N. E. Norman.
Appita (Journal of the Australian and New Zealand Pulp and Paper Industry Technical Association), Vol 29, No 1, p 36-40, July, 1975. 3 fig.

Descriptors: Pulp and paper industry, *Australia, *Water reuse, Water conservation, Water pollu-

tion control, Economics, Equipment, Water treatment, Recycling, Water, Pollution abatement, Foreign countries, *Pulp wastes, Industrial wastes.

The principal reasons for water reuse (i.e., resource scarcity, environmental constraints, and economic factors) are examined. Water reuse practices are described and the equipment and processes utilized to prepare the water for various recycling processes are shown to vary with quality and environmental requirements. Examples of water reuse systems utilized by Australian Paper Manufacturers Ltd. mills are included, and some of the problems associated with water reuse are discussed. The future of water reuse in the paper industry is considered. (Sykes-IPC)
W76-03578

REPORT ON WATER FOR ENERGY IN THE UPPER COLORADO RIVER BASIN.
Bureau of Reclamation, Denver, Colo. Water for Energy Management Team.
For primary bibliographic entry see Field 6D.
W76-03727

GEOTHERMAL LEASING PROGRAM, VOLS. II AND III--LEASING OF GEOTHERMAL RESOURCES IN THREE CALIFORNIA AREAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 4B.
W76-03925

THE ECONOMICS OF GEOTHERMAL RESOURCES IN THE IMPERIAL VALLEY: A PRELIMINARY ANALYSIS,
California Univ., Riverside. Graduate School of Administration.
H. J. Vaux, Jr., and B. Nakayama.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 182, $4.00 in paper copy, $2.25 in microfiche. California Water Resources Center, Contribution No 153, November 1975. 34 p, 1 fig, 6 tab, 83 ref. (California Water Resources Center Project UCAL-WRC-W-344).

Descriptors: *Geothermal studies, *Geothermal powerplants, *Electric power production, *Economic feasibility, Resource development, Model studies, Resources, Natural resources, Regulation, *California, Water supply, Capital costs.
Identifiers: *Imperial Valley(California).

A model based on the calculus of variations permits a preliminary assessment of the attractiveness of geothermal resources. If technological problems of handling water dominated geothermal system can be overcome, and if exploitation entails no major social costs in the form of land subsidence, increased seismicity and residuals generation, then it is likely that the resource could become an attractive source of power. The economic feasibility of power production will be particularly sensitive to the price of power, the cost of capital and the willingness of exploiter firms to bear risk. Without substantial changes in the conditions of supply and demand for water in the lower Colorado Basin, the geothermal fields are unlikely to be an attractive source of additional water supplies. Production of power from a Imperial geothermal resources will be crucially influenced by governmental regulation. The current practice of applying regulatory policies for oil and gas to geothermal development is inappropriate. More flexible regulatory strategies that account for uncertainties about the nature of the resource as well as social cost uncertainties are called for. Such strategies should be amenable to revision as more experience with the resource is gained. (Snyder-Calif, Davis)
W76-03959

APPLICATION OF REVERSE OSMOSIS IN WATER CONSERVATION AND TREATMENT IN THE MOTOR INDUSTRY,
Ames Crosta Mills and Co., Heywood (England).
For primary bibliographic entry see Field 5D.
W76-03992

3F. Conservation In Agriculture

IRRIGATION SYSTEM,
D. L. Bradshaw.
US Patent No 3,918,264, 6 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 631, November 11, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Surface irrigation, Furrow irrigation, Distribution systems, Irrigation efficiency, Water control, Flow control, Ditches.

A control system in an irrigation system controls the flow of water from a main irrigation ditch to a branch field ditch. A first control device is placed in the main ditch beyond the branch ditch in the direction of flow of the water and a second control device is placed in the branch ditch. The water flowing in the main ditch is diverted by the first control device in the main ditch, which is normally closed, through the second control device in the main branch ditch, which is normally open, and into the branch ditch, until some time as timer means in the first control device opens the first control device and the second control device is subsequently closed. The control devices are conduits placed centrally in the ditch in the direction of flow of water. A seal is secured to the interior surface of the conduit and extends around it. A valve is mounted in the conduit for axial and pivotal movement. A timer is fixed to activate the valves. (Sinha-OEIS)
W76-03502

ADJUSTABLE FULL SPRAY NOZZLE AND CHANGES REQUIRED ON IMPULSE SPRINKLERS TO ACCOMMODATE USE OF NOZZLE,
C. L. Best.
US Patent No 3,918,642, 3 p, 12 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 754, November 11, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, Irrigation systems, Irrigation efficiency, Water conservation, Water distribution(Applied), Application equipment.

A rotary water sprinkler device driven by the impact of the water jet issuing from a nozzle on a hammer has means to vary the elevation, with respect to the horizontal axis, of the issuing water jet so as to vary the range of area sprinkled. This is accomplished by an adjustable nozzle inserted perpendicularly into the discharging end portion of a water supply pipe. The hammer is provided with extensions that will receive the impact of the water issuing from the nozzle. The nozzle can be adjusted by means of a tool so as to emit a stream either parallel to the ground, 25 deg from the horizontal axis or between. This allows the use of more than one sprinkler at a time on one line, even if the areas to be watered are of differen size. Also it permits the issuing of very low water streams which resist breezes better than the streams issuing from conventional sprinklers. A further advantage is that water is saved since the stream of water can be better controlled according to the needs of the areas to be sprinkled. (Sinha-OEIS)
W76-03503

IMPACT AND REACTANT STEP-BY-STEP ROTARY SPRINKLER HEAD,
Nelson (L.R.) Corp., Peoria, Ill. (Assignee).
W. R. Malcolm.
US Patent No 3,918,643, 5 p, 4 fig, 5 ref; Offic Gazette of the United States Patent Office, V 940, No 2, p 755, November 11, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler rigation, Irrigation practices, Irrigation efficien Water distribution(Applied), Water conservati Application equipment.

A reversible part-circle step-by-step rotary sp kler head can achieve a favorable distribution p tern. This investion provides a sprinkler h which has a reactant element on the sprinkler b which is operable to deflect the water later only when the water is being obstructed by spoon of the impulse arm in which the torque plied to the sprinkler body by the reactant fo applied to the reactant surface is substanti reduced without a corresponding lessening of effectiveness of maintaining the deflected wate angular alignment with the direction unobstruc flow. This objective is obtained by moving reactant element radially inward into a radial p tion intermediate the inner and outer reactant faces of the impulse arm spoon. Torque reduc is achieved since the reactant force is applie the reactant element through a much smaller l arm. The reactant surface need not be as larg area since it is contacted by the water much ne the outlet at an earlier time before the flow has an opportunity to break up. Thus, not only is applied torque reduced by the reduction in sur area but the time of application is more ne simultaneous with the application of the in force. (Sinha-OEIS)
W76-03504

IRRIGATION SYSTEMS BY TRICKLING,
J. Leal-Diaz, and J. Rangel-Garza.
U S Patent No 3,918,646, 3 p, 12 fig, 7 ref, Of Gazette of the United States Patent Office 940, No 2, p 756, November 11, 1975.

Descriptors: *Patents, *Irrigation, *Irrig systems, *Sprinkler irrigation, Irrigation eff cy, Distribution systems, Water control, Ap tion equipment, Irrigation operation and tenance.
Identifiers: *Trickle irrigation.

A system for trickle irrigation, sprinkling a like provides simple, practical and efficient for self cleaning and a regularity in the dis flow of the emitters, independent to a dregree of the pressure and fluidity whic given moment may exist in the irrigation wa two piece water emitter is adapted for mo primarily inside a hollow conduction line confining wall with a outlet port member tioned near the exterior surface of the cond line for discharge of water. An entrance positioned inside the line and comprises bination: a stiff male member having the o the head for discharging fluid, a fitting for ing the wall of the conduction line to h member in place with the head substantiall with the confining wall and with a stiff ste tion defining a water conveyance duct for ing inside the hollow line to convey fluids the confining wall; and an elastic generall drical female section for fitting snugly a portion of the stem to form a wall portion fluid conveying duct and extend substantia ally into the line. The fluid entrance and ex extend from opposite ends of the femal (Sinha-OEIS)
W76-03505

DRIP IRRIGATION TAP AND SYSTEM,
AG International, Houston, Tex. (Assigne
J. K. Hoff, R. H. Garrett, M. J. Pastusek, a Goss.
U S Patent No 3,920,037, 4 p, 8 fig, 5 ref; Gazette of the United States Patent Off 940, No 3, p 1209, November 18, 1975.

iptors: *Patents, *Irrigation, *Surface irriga-
*Irrigation systems, Irrigation practices, Ir-
n efficiency, Applications equipment,
Tubes.
iers: *Drip irrigation.

p and drip irrigation system, when used with
irrigation device, provides an efficient
of applying fluid to crops, orchards. The in-
n includes pipe and a tap which is used in
ction with the pipe. The tap includes a
ical sleeve for surrounding a portion of the
traps and loops for securing the sleeve to
pe, a male stinger and a cannula located
the male stinger and extending through the
and pipe to serve as a passageway for fluid
ie pipe. The cannula is inserted into the pipe
t prior drilling or punching of the pipe. The
a does not produce a plug which falls into
e and is carried downstream, nor does it
e a core which will plug the cannula. (Sinha-

514

MINING THE POWER LEVEL AND
E OF SOLAR WATER-RAISING INSTAL-
NS IN THE TURKMEN SSR, (IN RUS-

arnizhevskii, and S. Khandovletov.
svoeniya Pustyn'. 4. 88-91. Illus. 1974.

tors: Mapping, *Water sources,
ock, Powerplants, Water supply.
ers: Turkmen-SSR, *USSR, *Solar water-
nstallations.

Ist time mapping was accomplished of the
rritories of Turkmen (USSR) with regard
vailable capacity of solar water-raising in-
ns for livestock. For most of the territory
er of installations is 80, 100 and 150 W.--
ht 1975, Biological Abstracts, Inc.
64

AVAILABILITY FOR IN-STREAM
: SNAKE RIVER, SWAN FALLS-HELLS
N DAM.
ater Resource Board, Boise.
ary bibliographic entry see Field 4A.
22

DIX 15, IRRIGATION, GREAT LAKES
RAMEWORK STUDY.
Lakes Basin Commission, Ann Arbor,
, Public Information Office.
p, 32 fig, 53 tab, 10 ref.

ors: *Great Lakes Region, *Irrigation,
d land, *Illinois, *Indiana, *Michigan,
ota, *New York, *Ohio, *Pennsylvania,
sin, Water requirements, Irrigable land,
lections, Water supply, Water sources,
ater, Surface waters, Soils, Soil groups,
s, Crops, Vegetable crops, Field crops,
ps, Beans, Potatoes, Sugar beets, Land
tion.

ndix identifies and evaluates the require-
d potentials of present and future irriga-
e Great Lakes Basin. Included are an in-
of present irrigation, future needs, soil
s, and a review of other irrigation re-
sin irrigation was evaluated as to irrigated
ount of water used, source of water, and
rends in irrigation. These were used to
future irrigation needs and potential for
ent. Basin soils were studied in order to
potential for irrigation, and availability
dwater. Well yield data for surficial
were used to determine where plentiful
f groundwater exist, and to indicate the
rable areas for irrigation. Previous irriga-
rts on segments of the Basin were
Data and projections from these reports
ented for comparison with the inventory and projections reported. Irrigation occurs on approximately 221,000 acres or 1% of Basin cropland, particularly those acres in high-value vegetables and fruits. Vegetables, including potatoes, account for 60% of the acreage. Corn (for grain), fruits, and sod each constitute approximately 10% of all irrigated acreage. The remainder includes dry beans, sugar beets, and miscellaneous uses. Irrigation in the four planning subareas around Lake Michigan equals 70% of all Basin irrigation. (Humphreys-ISWS)
W76-03868

EFFECT OF SOIL AND WATER CONDITIONS ON THE RURAL LANDSCAPE AROUND WOUW, NORTH BRABANT, (IN DUTCH),
M. F. Van Oosten.
Versl Landbouwkd Onderz (Agric Res Rep), 833, 1-156, Illus, 1975.

Descriptors: *Loam, Sands, Soils, Agriculture, *Land reclamation, Farm management, *Land use, Grasslands, Rural areas.
Identifiers: Landscape, *Netherlands.

The loamy san region around the village Wouw (Netherlands) is completely dominated by agricultural conditions. The characteristic geology, soil conditions and hydrology of this region are described and their influence on reclamation for farming and the development of agriculture. A suitability rating for arable and for grassland proved that present land use depends on the natural factors.--Copyright 1975, Biological Abstracts, Inc.
W76-03922

SOME PROBLEMS OF LARGE IRRIGATION CHANNEL CONSTRUCTION IN DESERT CONDITIONS, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W76-03972

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE HARVESTING OF ALGAE AS A FOOD SOURCE FROM WASTEWATER USING NATURAL AND INDUCED FLOCCULATION TECHNIQUES,
Louisville Univ., Ky.
For primary bibliographic entry see Field 5D.
W76-03571

A SUGGESTED STATE FOREST PRACTICES ACT (MECHANISM FOR IMPROVING WATER QUALITY ON FOREST LANDS),
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-03587

'IT'S OUR WATER'--CAN WYOMING CONSTITUTIONALLY PROHIBIT THE EXPORTATION OF STATE WATERS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6E.
W76-03589

ORDINANCE AMENDING THE COMPREHENSIVE ZONING ORDINANCE NO. 3011 (FOR FLOOD HAZARD PROTECTION, FORT WORTH, TEXAS).
Fort Worth, Tex.
For primary bibliographic entry see Field 6F.
W76-03599

INDIANA DUNES NATIONAL LAKESHORE (S 820).
For primary bibliographic entry see Field 6E.
W76-03600

PLANNING ASSISTANCE TO STATES (TO AID IN PREPARATION OF COMPREHENSIVE PLANS FOR WATER AND RELATED RESOURCES).
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-03605

FLOOD HAZARD PATTERNS OF URBAN DEVELOPMENT IN THE UPPER MIDWEST,
Western Illinois Univ., Macomb. Public Policy Research Inst.
D. Singer, and N. Walzer.
Army Corps of Engineers, Rock Island, Illinois, January 1975. 146 p, 36 tab, 4 append, 194 ref. DACW-25-75-C-0010.

Descriptors: *Flood damage, *Population, *Forecasting, *Flood plains, Flood protection, Future planning(Projected), Research priorities, Land use, Cities, Growth rates, *Methodology, *Illinois.
Identifiers: *Flood damage forecasting, *Urban development, Upper Midwest, Iowa(Ia), Illinois(Il), Minnesota(Mn), Missouri(Mo), Wisconsin(Wi).

This study develops a methodology for forecasting flood damage. Social and economic similarity was found between 72 urban areas located in flood plains and 67 areas not subject to flood, located in 5 states (IA, IL, MN, MI, WI). Relationships between economic characteristics and population were studied. Measures of potential flood damage and actual protection were compared with data on damages. The presence or absence of a flood plain is a valid dichitomization of urban areas, and the relationship between actual or potential flood damage and urban characteristics is dominated by the scale effect of total population. Per capita flood damage is sensitive to population growth rate, income and industrial composition. Population size can be used to forecast damages. Projections were obtained for years 2000 and 2020. Though there is great diversity in population changes, on the average, growth will be less rapid in areas subject to flood, though the opposite was true in the past. Today it appears that flood danger or protection will have little impact on growth. It was found, however, that urban areas located in flood plains show a positive correlation between income levels and population increases, though not in non-flood areas. The relationship between population and annual flood damage was estimated for 2 years using multiple regression. A range of estimates was made for various growth rates. Substantial variability is present, not attributable to population level, and therefore results are viewed as tentative. (Smith-North Carolina)
W76-03627

OKANAGAN WATER DECISIONS,
Simon Fraser Univ. Burnaby (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 5G.
W76-03630

WATER AVAILABILITY FOR IN-STREAM FLOWS: SNAKE RIVER, SWAN FALLS-HELLS CANYON DAM.
Idaho Water Resource Board, Boise.
April 1974. 55 p, 2 fig, 9 tab, 2 ref, 2 append.

Descriptors: *Water resources, *Streamflow, *Comprehensive planning, *Idaho, Hydrology,

Hydrologic budget, Irrigation efficiency, Irrigation, Groundwater, Water demand, Water requirements, Flow augmentation, Hydrologic systems, Simulation analysis, Computer models, Recreation, Flow rates, Rivers.
Identifiers: *Snake River(Idaho), *River management, Flow deficits, Flow objectives.

This study was designed to provide input to the Pacific Northwest River Basins Commission Comprehensive Joint Plan and the Idaho State Water Plan. Potential conflicts between future streamflow depletion and in-stream uses were identified. Recommended minimum flows for boating, fishing, water quality, and aquatic life were used as planning objectives in evaluating uses of the waters of the Snake River system. River flows were computed as monthly runoff volumes throughout the 1928-1968 period. Hydrologic studies were based on present and future (year 2020) conditions, assuming no restrictions on future development from water supply. A computer simulation of the Snake River reservoirs, diversions, and river flows under prescribed management was used for hydrologic evaluations. The study concluded that present condition flows do not meet demands 100% of the time and that groundwater and increased irrigation efficiency would be part of future solutions. (Terstriep-ISWS)
W76-03722

FLOOD HAZARDS ALONG THE BALCONES ESCARPMENT IN CENTRAL TEXAS--ALTERNATIVE APPROACHES TO THEIR RECOGNITION, MAPPING, AND MANAGEMENT,
Texas Univ. at Austin. Dept. of Geological Sciences.
V. R. Baker.
University of Texas, Bureau of Economic Geology, Geological Circular 75-5, 1975. 20 p, 12 fig, 2 tab, 105 ref.

Descriptors: *Flood plain zoning, *Flood plain insurance, *Flood profiles, *Rainfall-runoff relationships, *Geomorphology, *Texas, Flood ways, Flood control, Land use, Hydrology, Hydraulics, Geologic formations, Meanders, Management, Planning, Mapping.
Identifiers: *Flood hazard mapping, Flood plain management, Flood risk, Balcones Escarpment(Tex), Flood plain regulation, Soils method, Botanic method, Geologic method.

A number of alternatives to flood hazard mapping were examined, including the detailed hydraulic-hydrologic methods, the soils identification method, botanic analysis, and geologic examination. The costs of these methods were shown to vary widely, and the trade-offs were examined. Present day planning tools such as local flood risk reports, flood-plain regulation, flood insurance, flood control, and land use planning, were also discussed. It was shown that, to be effective, flood hazard information must reach local government and serve as the basis for land use regulation. (Terstriep-ISWS)
W76-03723

REPORT ON WATER FOR ENERGY IN THE UPPER COLORADO RIVER BASIN.
Bureau of Reclamation, Denver, Colo. Water for Energy Management Team.
For primary bibliographic entry see Field 6D.
W76-03727

OUTPUT FROM A CASCADE OF DISCRETE LINEAR RESERVOIRS WITH STOCHASTIC INPUT,
Department of Environment, Ottawa (Ontario). Hydrology Research Div.
For primary bibliographic entry see Field 2E.
W76-03742

UNSTEADY UNCONFINED FLOW INTO A SURFACE RESERVOIR,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-03744

LIMESTONE DRAINAGE SYSTEMS,
Birmingham Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2F.
W76-03747

USE OF SATELLITE DATA IN URBAN HYDROLOGIC MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-03748

STORMFLOWS AND EROSION AFTER TREE-LENGTH SKIDDING ON COASTAL PLAIN SOILS,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W76-03756

BULL RUN SAFE YIELD STUDY,
D. Beyerlein.
Hydrocomp Simulation Network Newsletter, Vol 7, No 3, p 1-4, April 1, 1975. 3 fig, 3 tab.

Descriptors: *Water supply, *Model studies, *Mathematical models, Reservoirs, Water demand, Water resources, Water management(Applied), Administration, Oregon, Watershed management.
Identifiers: Bull Run watershed(Ore).

An assessment of the probable yield of the Bull Run Watershed reservoir system was performed for the Bureau of Water Works of the City of Portland, Oregon. The concept of expected yield was evaluated with a probabilistic approach. Many flow traces were generated, each with the same statistical properties as the observed sequences and its own specific storage requirement. The large number of traces used made it possible to compute the probability that a given storage would be adequate to meet a specific demand. Three demand sequences for the period 1970 to 2020 were tested. Eight alternative combinations of reservoirs and reservoir modifications were identified. The combinations provided a range of total active storage from 45,350 to 126,450 acre-feet. The storage probability curves generated allowed the Bureau to determine what reservoir storage is needed to meet the various demand sequences. The Bureau can also decide the maximum economic storage capaciy of the Bull Run reservoir system and then calculate the costs and benefits of seeking additonal water customers. (Orr-FIRL)
W76-03792

THE RIVER THAMES FLOOD DEFENCE BARRIER,
Great London Council, (England), Dept. of Public Health Engineering.
R. W. Horner.
The Public Health Engineer, Vol 17, p 120-124, September, 1975. 5 fig, 4 ref, 1 append.

Descriptors: *Flood control, *Flood protection, Cost analysis, Statistical methods, Estuaries, Tides, Wind tides, Floodgates, Flood routing, Navigation, Water supply, Water storage, Water quality, Hydraulic gates.
Identifiers: *Defense barrier, Thames Estuary, London(England), Statistical analysis, High tides.

Statistical analysis performed on high and low water levels of the Thames Estuary near London indicated that the probability of bank full cond tions and serious flooding has increased co siderably. Cost analysis of the effects of floodi on the area showed that an improvement of t standard defense was needed. Various schem and the one actually selected are considered. T area considered has a high population, a co siderable amount of industry with high capital i vestment and numerous public facilities, indic ing that a major flood could have a large impact f years to come. High tides can be caused by number of factors, such as low air pressure, depression, wind stress on the water surface a the normal gravitational pull of the sun and moo and if these factors occur together for a lo period of time, flooding can occur. Alternat solutions to the traditional methods of flood co trol fell into three main categories: attenuation the inflowing tide by a structure that could p tially close the Estuary; complete closure of Estuary; and reduction of water levels by ov spilling the excess water into low lying marsh The most feasible was found to be a struct capable of either complete or partial closure of Estuary. Investigations were undertaken to cho a suitable site and design. Navigational openi were provided and the gates could be closed i minutes, using hydraulic cylinders. Stu showed that other benefits of this structure co be derived, such as improvement of water qua water storage for water supply, power generat navigation and amenity and recreation u (Pinto-FIRL)
W76-03800

APPENDIX 2, SURFACE WATER HYDRO GY, GREAT LAKES BASIN FRAMEWO STUDY.
Great Lakes Basin Commission. Ann A Michigan, Public Information Office.
For primary bibliographic entry see Field 2E.
W76-03862

APPENDIX 11, LEVELS AND FLOWS, GR LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann A Michigan, Public Information Office.
1975. 206 p, 75 fig, 71 tab, 70 ref.

Descriptors: *Great Lakes, *Water l *Hydrology, *Hydraulics, *Regulated *United States, *Lake Erie, *Lake Huron, Michigan, *Lake Ontario, *Lake Superior Lawrence River, Geomorph Watersheds(Basins), Data collections, Lake basins, Lake shores, Hydrologic Precipitation(Atmospheric), Hydrologic as Evaporation, Diversion, Management, Pla Model studies, Research and develop Navigation.
Identifiers: Problems and needs.

This appendix described the factors which Great Lakes water levels and outflo discussed the physiography, hydraulics hydrology of the Great Lakes-St. Lawrenc system; diversions into, out of, and wit system; and lake regulation. In the discus regulation, the effects of lake level fluctua the various interests within the Basi developed. Considered in detail were probl lated to the various artificial factors whic lake levels and outflows. These artificial include diversions, connecting channel c increased consumptive loss of water, and sion of the navigation season on the Great The latter will require detailed hydraulic and close operational surveillance of co channels. The relationships of many of the which affect the fluctuation of the lake le not completely understood. This situation improved by an active physical research extending the engineering studies curr progress for the International Joint Comm study. Precipitation on the Great Lakes their tributary land areas is the source o

er entering the Lakes. On the average, more
n half of this water is removed from the Lakes
evaporation. Variations of these two factors are
ely responsible for the long-term water level
tuations. Further investigation of these factors
ssential for more effective management of lake
ls. (Humphreys-ISWS)
5-03865

PENDIX 14, FLOOD PLAINS, GREAT KES BASIN FRAMEWORK STUDY.
at Lakes Basin Commission, Ann Arbor,
higan, Public Information Office.
. 327 p, 65 fig, 118 tab, 134 ref.

criptors: *Great Lakes Region, *Flood plains,
ce basins, *Watersheds(Basins), *United
es, *Lake Erie, *Lake Huron, *Lake
higan, *Lake Ontario, *Lake Superior,
ds, River basins, Flood damage, Flood pro-
on, Data collections, Geomorphology, Flood-
Cities, Land development, Land use, Land
ification.
tifiers: *Flood problems, Flood plain develop-
..

appendix consists of an assessment of the
n's flood plains and associated present and fu-
problems. Associated drainage problems are
nted in Appendix 16, Drainage. Shoreline
ing problems, which are not considered in
ppendix, are included in Appendix 12, Shore
and Erosion. Most damaging floods in the
have occurred in the late winter or early
g as a result of rain and snowmelt on frozen
arly saturated ground. Ice jams at the mouths
e rivers emptying into the major lakes often
vate the flood situation. Intense summer
s have also created destructive floods, but
are ordinarily confined to local areas.
ite gains in flood control measures during the
three decades, major flooding problems are
asing in urban and highly developed agricul-
areas throughout the Basin. Much of the
ge and personal tragedy caused by Tropical
Agnes, the most expensive and destructive
al disaster in the country's recorded history,
hit the Middle Atlantic States in June 1972,
direct result of expanding development on
rable flood plains. Flood damage reduction
e accomplished through control of rivers or
flood plains. Stron efforts must be made to
flood plain development. Where significant
achment has already occurred, levees, dams,
her man-made devices may be used. Neither
d in itself has the total answer to flood
ge reduction, but both must be proportioned
uce the economic and physical hardships in-
by flood waters. (Humphreys-ISWS)
3867

NDIX 16, DRAINAGE, GREAT LAKES FRAMEWORK STUDY.
Lakes Basin Commission, Ann Arbor,
gan, Public Information Office.
7 p, 35 fig, 47 tab.

ptors: *Great Lakes Region, *Drainage,
age effects, *Drainage systems, *Soil clas-
on, *Soil groups, *Soil investigations, *Soil
re, *Soil properties, *Soil surveys, *Cost-
analysis, Subsurface drainage, Soil-water-
elationships, Urban drainage, Urbanization,
lture, Agricultural watersheds, Data collec-

iers: *Agricultural drainage, *Land
ge.

ge problems caused by excess water in the
ofile that limits the use of the land for both
tural and urban pruposes were examined in
pendix. Agricultural problems were defined
gorizing soils into five conditions varying
adequate drainage and flood control' to
ned flood and drainage problems.' The soil
ies were used to determine the relative
drainage problems in each county. The same type of soil classification was used to identify problem areas in existing and potential urban areas. Drainage needs for the future were projected, and alternative programs along with their land cost and impact were presented. It was concluded that about 12 million of the 32 million acres of agricultural lands in the Great Lakes Basin have drainage problems. (Terstriep-ISWS)
W76-03869

REGIONAL SKEW IN SEARCH OF A PARENT,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-03899

RAINFALL-RUNOFF RELATION FOR REDWOOD CREEK ABOVE ORICK, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2A.
W76-03903

STATISTICAL SUMMARIES OF STREAMFLOW RECORDS, OKLAHOMA, THROUGH 1974,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W76-03904

HYDROLOGY OF MALHEUR LAKE, HARNEY COUNTY, SOUTHEASTERN OREGON,
Geological Survey, Portland, Oreg.
L. L. Hubbard.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 717, $4.00 in paper copy, $2.25 in microfiche. Water-Resources Investigations 21-75, August 1975. 40 p, 12 fig, 10 tab, 12 ref.

Descriptors: *Hydrologic data, *Lakes, *Oregon, *Hydrologic budget, *Hydrologic equation, Inflow, Discharge(Water), Water levels, Surface-groundwater relationships, Water storage, Evapotranspiration, Precipitation, (Atmospheric), Water quality, Chemical analysis.
Identifiers: *Malheur Lake(Oreg), *Harney County(Oreg).

The various components of inflow and outflow to and from Malheur Lake in Harney County, Oregon, and their relative magnitudes are identified. In 1972 water year the total inflow to the lake was 200,000 acre-ft, but it was only 75,000 acre-ft in 1973 water year. In 1972 water year the Donner und Blitzen River contributed 55 percent of the inflow, with Silvies River, direct precipitation, and Sodhouse Spring contributing 28, 13, and 4 percent respectively. In 1973 the Donner und Blitzen River contributed 61 percent of the inflow. The Silvies River, direct precipitation, and Sodhouse Spring contributed 1, 25, and 12 percent respectively. Groundwater inflow, other than Sodhouse Spring, was negligible. In 1972 water year, 81 percent of the outflow was by evapotranspiration and 19 percent was surface outflow through The Narrows. In 1973, 96 percent of the outflow was by evapotranspiration and 4 percent was surface outflow through The Narrows. Groundwater outflow was negligible. (Woodard-USGS)
W76-03906

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1975.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W76-03907

HYDROLOGIC UNIT MAP--1974, STATE OF ARIZONA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-03909

HYDROLOGIC UNIT MAP--1974, STATE OF CALIFORNIA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-03910

DRAINAGE AREAS FOR ILLINOIS STREAMS,
Geological Survey, Champaign, Ill.
For primary bibliographic entry see Field 7C.
W76-03913

WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES, VOL II,
Economic Research Service, Washington, D. C., Natural Resources Economic Div.
For primary bibliographic entry see Field 6E.
W76-03916

WATER ALLOCATION,
Stanford Environmental Law Society, Calif.
R. W. Harris, W. D. Jeffery, and B. W. Stewart, Jr.
In: Instate Environmental Problem, p. 34-56, Stanford Law School, Stanford, California, 1974. 23 p, 71 ref.

Descriptors: *Water allocation(Policy), *Riparian rights, *Appropriation, *Federal-state water rights conflicts, *Surface waters, Permits, Surface water availability, Urbanization, Prescriptive rights, Water law, Riparian waters, Federal government, Industrial water, Navigation, Reservation doctrine, History, Indian reservations, California, Groundwater, State governments, Water utilization, Diversion.
Identifiers: California Doctrine, Navigation Servitude Doctrine, Newlands Project, Pyramid Lake, State policy.

This article examines three prinicipal systems of water allocation in the United States: the riparian system of the humid East, the appropriation system of the arid West, and the often conflicting federal water law system. Under the riparian system, only the owner of land along a watercourse has the right to reasonable use of water as it passes or crosses his property. This right is shared equally with other riparian owners. As water demand has increased with urban and industrial growth, more states are adopting the appropriation system. Appropriated water rights are obtained by diversion to a beneficial use. As a prerequisite to diverting water, most Western states require permits. However, all state systems must yield when in conflict with federal water law, which is largely court created and widely diverse. Two federal doctrines allow the United States to seize or impair water rights without paying compensation: these are the navigation servitude doctrine and the reservation doctrine. Both doctrines give federal courts great discretionary power in deciding water allocation. This is illustrated by an examination of federal decisions allocating water to Indian reservations. (Parrish-Florida)
W76-03920

EFFECT OF SOIL AND WATER CONDITIONS ON THE RURAL LANDSCAPE AROUND WOUW, NORTH BRABANT, (IN DUTCH),
For primary bibliographic entry see Field 3F.
W76-03922

COWANESQUE LAKE, COWANESQUE RIVER, TIOGA COUNTY, PENNSYLVANIA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 8A.
W76-03923

NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT DREDGE RIVER CHANNEL, VOLUME 1, (ENVIRONMENTAL IMPACT STATEMENT).
Department of the Navy, Washington, D.C.

For primary bibliographic entry see Field 8A.
W76-03924

CORKSREW SANCTUARY: USE OF THE MARKET FOR PRESERVATION,
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 6G.
W76-03928

FLOOD HAZARD AREAS.
Vermont State Agency of Environmental Conservation, Monpelier.
For primary bibliographic entry see Field 6F.
W76-03934

GUIDELINES FOR DELINEATION OF FLOODWAYS AND FLOOD HAZARD AREAS.
Indiana State Dept. of Natural Resources, Indianapolis.
For primary bibliographic entry see Field 6F.
W76-03935

MODEL ZONING ORDINANCE FOR FLOOD HAZARD AREAS.
Indiana Dept. of Natural Resources, Indianapolis.
For primary bibliographic entry see Field 6F.
W76-03936

SOME PROBLEMS OF LARGE IRRIGATION CHANNEL CONSTRUCTION IN DESERT CONDITIONS, (IN RUSSIAN),
B. K. Balakaev.
Probl Osvoeniya Pustyn'. 4. 41-46. Illus. 1974.

Descriptors: *Deserts, *Irrigation, *Channels, *Construction, Canals, Pumping, Crop production, River basins, Operations, *Canal construction.
Identifiers: *USSR.

Theoretical, field and laboratory studies were made of the problems of design, construction and exploitation of the V. I. Lenin Kara kum canal (USSR). Data were obtained concerning hydraulic conditions of operation, water losses in sandy desert and operating conditions of pumps. The results are useful for solving problems of water delivery a great distance from the basins of rivers by means of large channel construction in desert lands (for crop irrigation).--Copyright 1975, Biological Abstracts, Inc.
W76-03972

4B. Groundwater Management

DEALING WITH OIL SPILLAGE CONTAMINATION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W76-03522

UNIQUE DESIGN IDEAS MAY INCREASE BIT LIFE.
For primary bibliographic entry see Field 8C.
W76-03523

NEW LOG DATA GIVE BETTER NORTH SEA WELL COMPLETIONS,
Conoco North Sea, Inc., London (England).
G. M. Hodson, W. H. Fertl, and G. W. Hammack.
World Oil, Gulf Publishing Company, p 60-65, September 1975. 5 fig.

Descriptors: *Borehole geophysics, *Porosity, *Permeability, *Petrography, Reservoirs, Radioactive logging, Electric logging, Heavy metals.
Identifiers: *Mica, Zircon, *North Sea, Spectrographic gamma ray.

Several methods are illustrated of using geophysical well logs to determine reliable estimates of porosity and permeability where heavy minerals may mask important reservoir characteristics. The lithology of the area being studied consists of a sand/shale sequence, with decreasing grain size from top to bottom of the interval. The unit being studied was of Lower and/or Middle Jurassic Age. Porosity in the medium to coarse sands ranges from 20-30%, with a permeability range of 40 md to 15 darcies. The fine grained and silty reservoir rocks which have less porosity and lower permeability contain considerable quantities of detrital mica, and other heavy minerals. It is difficult to develop a relationship between core derived porosity and horizontal permeability in units containing highly micaceous intervals. The ratio of horizontal to vertical permeability in clean sands is generally about 2:1, however, in micaceous sand intervals the ratio may exceed 10:1. Analysis of the geophysical logs showed the following: (1)Spontaneous potential curve was not able to delineate the clay from micaceous zones; (2)High gamma ray readings resulted from heavy minerals such as mica, zircon, and silt, especially when curves were superimposed upon the shale effect; (3)Neutron logs were unaffected by mica content; therefore, Density and Neutron logs can be utilized to qualitatively differentiate clay and mica on an overlay of compatible sealed porosity logs. Schlumberger's experimental Gamma Ray Spectroscopy Log has encouraging possibilities for improving quantitative mica and shale estimates to allow more accurate determination of effective porosity and reliable net sand count in micaceous sections. (Gass-NWWA)
W76-03524

STOP LEACHATE PROBLEMS,
Lenard Engineering, Storrs, Conn.
For primary bibliographic entry see Field 5B.
W76-03525

A PRELIMINARY REPORT ON ANOMALOUS PRESSURES IN DEEP ARTESIAN AQUIFERS IN SOUTHEASTERN NORTH CAROLINA,
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Resources Planning and Evaluation.
H. M. Peek, and L. A. Register.
Report of Investigation No 10, 1975. 19 p, 8 fig, 1 tab.

Descriptors: *Hydraulic gradient, *Potentiometric level, *North Carolia, Recharge, Liquid waste, Osmotic pressure, *Artesian wells, Coastal plains, *Pressure, *Artesian aquifers.
Identifiers: *Tectonic force, *Anomalous pressure, Seismic activity, Great Carolina Ridge, Cape Fear Arch.

Unusually high pressures occur in the deeper artesian aquifers beneath part of southeastern North Carolina. A series of ground water research stations, consisting of exploratory wells drilled to the basement rock and the significant aquifers, are being constructed. The area overlies a wedge of sedimentary rocks ranging in thickness from 200 feet along the western part to 1,500 feet along the southern part of the study area. These sediments range in age from Cretaceous to Recent. The piezometric surface of the aquifer unit forms a ridge roughly parallel to the coast. The configuration shows that these anomalous pressures are not related to recharge. Data indicate that the anomalous pressures in the lower unit of the Cretaceous aquifer system may be related to a rise in elevation of the land surface in southeastern North Carolina. The chloride distribution and configuration of the pressure surface indicate that the anomalous pressure gradient is a recent phenomenon. Changes in pressure may be used as an index of seismic activity in this area. (Gass-NWWA)
W76-03526

FILTER-PACK INSTALLATION AN REDEVELOPMENT TECHNIQUES FOR SHA LOW RECHARGE SHAFTS,
Agricultural Research Service, Fresno, Ca Water Management Research.
R. L. McCormick.
Ground Water, Vol 13, No 5, p 400-405, S tember-October 1975. 7 fig.

Descriptors: *Artificial recharge, Surg Shafts(Excavation), *California.
Identifiers: *Recharge shafts, *Filter-pack mat als, Redevelopment techniques, Fresno(Ca Leaky Acres Recharge Project(Calif).

The potential for artificial ground water recha through shallow shafts was conducted at Leaky Acres Recharge Project in Fresno, Cali nia. The research was directed toward develo methods for constructing and placing filter-p materials and procedures for periodically clea filter materials to regenerate initial intake r Preliminary results are presented of two ferently constructed shallow shafts. Scre canal water was recharged into the shaft. In a c bined period of 94 days, 50.8 X 1000 cubic me of water were recharged at an average rate of liters per second. Shaft No. 1 was regenerate 109 percent of its original rate, but shaft No. 2 regenerated to only 78 percent of its original Redevelopment with a submersible pump more efficient than a centrifugal pump in remo the clogging particles from the shaft-filter-materials. Piezometric head losses indicated most of the clogging that occurred was conta within the filter-pack material. (Gass-NWWA
W76-03527

DANGER OF PESTICIDE POLLUTION OF TIFICIALLY REPLENISHED GROUNDWA RESERVES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemic Mikrobiologii i Gigieny, Vilnius (USSR).
For primary bibliographic entry see Field 5B.
W76-03649

MECHANIZATION OF WATER-RA FROM THE WATER-ACCUMULATING W 'CHIRLE', (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkh Research Inst. of Agriculture.
O. B. Khellenov, and A. S. Ovezmuradov.
Probl Osvoeniya Pustyn'. 4. 91-9. 1974.

Descriptors: Maps, Deserts, Water supply, wells, Grazing, Rangelands, Sheep.
Identifiers: *USSR, Turkmen SSR.

A schematic map was compiled of the Tu SSR (USSR) desert range lands suitable fo supply by water-accumulative wells. The we provide the watering for an area with capacity of 1 million sheep. Technical r ments were developed for mechanizing wat ing.--Copyright 1975, Biological Abstracts, W76-03663

EFFECTS OF A SANITARY LANDFI GROUNDWATER QUALITY IN ASH NEW HAMPSHIRE,
New Hampshire Univ., Durham. Inst. of and Environmental Resources.
For primary bibliographic entry see Field 5 W76-03721

UNSTEADY UNCONFINED FLOW I SURFACE RESERVOIR,
Birmingham Univ. (England). Dept of C gineering.
For primary bibliographic entry see Field W76-03744

DERGROUND WATERS OF THE LOWER
TT--A MODEL STUDY,
artment of Scientific and Industrial Research,
er Hutt (New Zealand). Physics and Engineer-
Lab.
primary bibliographic entry see Field 2F.
-03753

FUTURE OF WATER RESOURCES IN
THEASTERN ILLINOIS,
is State Water Survey, Urbana.
primary bibliographic entry see Field 6D.
-03755

ELOPMENT OF IRON AND MANGANESE
TERIA IN RANNEY WELLS,
primary bibliographic entry see Field 5B.
-03761

UND-WATER RECHARGE SIMULATION,
South Wales Univ., Kensington (Australia).
lty of Military Studies.
Amar.
al of the Hydraulics Division Proceedings of
E, Vol 101, No. HY9, p 1235-1247, Sep-
er, 1975. 6 fig, 17 ref.

riptors: *Model studies, *Recharge, ndwater movement, *Groundwater rge, *Simulation analysis, *Mathematical s, Equations, Aquifers, Flow, Analytical iques, Hydrodynamics, Hydrologic aspects. fiers: Accelerated Liebman Method, Non- potential theory.

wo-dimensional hydrodynamic behavior of rge of an unconfined aquifer was formulated, on nonlinear potential theory. The solution s equation was presented based on the Ac- ted Liebman Method. The flow was as- d to be unsteady and the aquifer medium was ed to be saturated, homogeneous, and pic. Yhe validity of currently known analyti- lutions for the various linearized cases was xamined. Comparisons were made between mensionless theory curves obtained and the ent experimental data. A correlation en classical D-F theory and potential theory nstrated that, except under severely ted values of certain parameters, the non- potential theory may provide the answer for ect description of the problem relating to the dynamics of recharge. This analysis offered vement in its accuracy and helped to explain of the observed deviations between the mathematical solutions and experimental r several cases. The method developed may plied to regional flow models involving non- geneous and anisotropic solids, to systems omplicated geometry, and to three-dimen- cases. (Kramer-FIRL)
3801

TES IN WISCONSIN GROUND WATER,
nsin State Lab. of Hygiene, Madison.
mary bibliographic entry see Field 5B.
3803

GES OF THE GROUNDWATER SUPPLY
ITIONS IN CONNECTION WITH CON-
CTION OF RESERVOIRS (BASED ON EX-
NCE OF THE GORKI RESERVOIR, (IN
AN),
vskii Meditsinskii Institut (USSR).
mary bibliographic entry see Field 5C.
3804

ONTROL OF POLLUTION OF GROUND-
R,
River Purification Board, Glasgow
nd).
mary bibliographic entry see Field 5G.
815

THE CONSTRUCTION AND OPERATION OF GRAVEL WELL SOURCES WITH PARTICULAR REFERENCE TO THOSE OF THE NENE AND OUSE WATER BOARD,
For primary bibliographic entry see Field 3B.
W76-03817

GEOCHEMICAL FACTORS AFFECTING ARTIFICIAL GROUNDWATER RECHARGE IN THE UNSATURATED ZONE,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 5G.
W76-03818

ASSESSING PHYSICAL POTENTIAL FOR DEEP DISPOSAL OF INDUSTRIAL WASTES BY WELLS IN THE SOUTHEASTERN UNITED STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
For primary bibliographic entry see Field 5E.
W76-03840

THE EFFECT OF SANITARY LANDFILLS ON WATER QUALITY IN SOUTHERN INDIANA,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-03851

APPENDIX 3, GEOLOGY AND GROUND WATER, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan , Public Information Office.
For primary bibliographic entry see Field 2F.
W76-03863

EVALUATION AND PROPOSED STUDY OF POTENTIAL GROUND-WATER SUPPLIES, GALLUP AREA, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
W. L. Hiss.
Open-file report 75-522, September 1975. 153 p, 4 fig, 2 tab, 243 ref.

Descriptors: *Groundwater resources, *Water supply, *Municipal water, *Water resources development, *New Mexico, Planning, Surveys, Reviews, Water demand, Publications, Bibliographies, Evaluation, Hydrologic data, Water quality.
Identifiers: *Gallup(N Mex).

The groundwater potential of 5 areas in central-western New Mexico within 85 miles of Gallup, N. Mex. was evaluated by reviewing published literature (bibliography included in report), inspecting aerial and space photographs, and interviewing ranchers and personnel employed by well-drilling and mineral-exploration companies. The San Andres Limestone and underlying Glorieta Sandstone of Permian age are the oldest aquifers capable of yielding water of a quality suitable for municipal use. The San Andres-Glorieta aquifer is a potential source of water for the city of Gallup south and southwest of the Zuni Mountains in the North Plains-Malpais and Zuni Southwest areas of this report. Without artificial stimulation of wells, the San Andres-Glorieta aquifer system should yield 100 gpm of water containing 500 to 1,000 mg/litre dissolved solids from depths ranging from 2,000 to 3,500 ft. Artificial stimulation by acidization and hydraulic fracturing of wells tapping the aquifer system could increase the yields several fold. (Woodard-USGS)
W76-03905

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1975.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W76-03907

SUMMARY OF HYDROLOGIC CONDITIONS AND EFFECTS OF WALT DISNEY WORLD DEVELOPMENT IN THE REEDY CREEK IMPROVEMENT DISTRICT, 1966-73,
Geological Survey, Winter Park, Fla.
For primary bibliographic entry see Field 4C.
W76-03908

THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1974,
Geological Survey, Mineola, N.Y.
E. J. Koszalka.
Long Island Water Resources Bulletin LIWR-5, Suffolk County Water Authority, 1975. 7 p, 1 fig, 3 plate, 15 ref.

Descriptors: *Water levels, *Water table, *Maps, *Contours, *Oberservation wells, New York, Basic data collections, Hydrologic data, Water level fluctuations, Measurement.
Identifiers: *Long Island(N.Y.).

Maps of water-level measurements in 364 observation wells in Long Island, N.Y., in March 1974 show that the altitude of the water table ranged from more than 10 feet below sea level in eastern Queens County to nearly 120 feet above mean sea level in northwestern Nassau County. The water table rose considerably during the period 1970-74 throughout most of Long Island in response to the above-normal precipitation during 1972 and 1973. In Kings County, the net rise in water levels was generally less than 4 feet. In western Queens County, a maximum rise of about 8 feet was recorded, but in eastern Queens County water levels declined about 4 feet. Net water-level rises generally ranged from 2 to 11 feet in northern Nassau County and were less than 4 feet in the southeastern part of the county. In southwestern Nassau County, however, water levels declined locally by nearly 4 feet. In western and central Suffolk County, a maximum net rise of about 8 feet was recorded. In eastern and southern Suffolk County, net rise was less than 4 feet. (Woodard-USGS)
W76-03911

HARFORD COUNTY GROUND-WATER INFORMATION: WELL RECORDS, CHEMICAL QUALITY DATA, AND PUMPAGE,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 7C.
W76-03912

WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES, VOL 11,
Economic Research Service, Washington, D. C., Natural Resources Economic Div.
For primary bibliographic entry see Field 6E.
W76-03916

NEEDED: A GROUND-WATER TREATY BETWEEN THE UNITED STATES AND MEXICO,
B. G. Burman, and T. G. Cornish.
Natural Resources Journal, Vol 15, p 385-404 (1975). 20 p, 69 ref.

Descriptors: *Mexico, *Southwest U.S., *Water table, *Groundwater, *Treaties, Regulation, Legal aspects, International law, Groundwater resources, Groundwater mining, Water law, State governments, Federal government, Competing uses, Water allocation(Policy), Groundwater availability, Subsurface waters, Water sources, Water supply, Irrigation, Potable water, *United States, Water demand.

The increasing water needs of the expanding population in the Southwest cannot be met by the available surface water. Already the cities and farms in this area are using the reserves of underground water. As a result of this increased use of groundwater, the water table is being lowered at

an alarming rate. The need for closer regulation of groundwater resources cannot be handled effectively by either the United States or Mexico acting unilaterally. A treaty between the United States and Mexico is necessary to regulate groundwater reserves. This treaty most involve both nations as sovereign bodies. Although the affected States should be consulted, the needs of the various States must ultimately be subservient to the greater national purpose and to federal regulation. (Nursey-Florida)
W76-03918

GEOTHERMAL LEASING PROGRAM, VOLS. II AND III--LEASING OF GEOTHERMAL RESOURCES IN THREE CALIFORNIA AREAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-CA-73-1681-F-2. October 24, 1973, 547 p, 30 map, 39 photo, 68 tab, 2 dia.

Descriptors: *Environmental effects, *Geysers, *California, *Geothermal studies, *Thermal power, Thermal water, Subsurface waters, Hydrothermal studies, Federal government, Administrative agencies, Thermal power plant, Electric power production, Hot springs, Steam, Water temperature, Leases, Pacific Coast region, Southwest U.S., Land, Land use, Forests, Agriculture, Grazing, Recreation, Wildlife habitats.
Identifiers: *Environmental Impact Statement, Geothermal resources.

Leasing of federally owned potential geothermal resources in The Geysers Known Geothermal Resource Area near the San Francisco, California, is the subject of the proposed project. The lands under consideration presently are used for grazing, forestry, mining, fish and wildlife habitat, outdoor recreation, and watersheds. As a result of the project, land would be restricted from uses such as wildlife habitat, recreation, and grazing. Terrain would be modified through construction of roads, wells, pipelines, and industrial facilities. Possible adverse effects include noise and noxious gas emissions, and land subsidence. Alternatives considered were: (1) postpone leasing, (2) decline leasing, (3) limit leasing to natural resource or mineral rights lands, (4) lease selected areas, and (5) lease only a prototype area. In order to gain long-term benefits of electrical production, some short-term uses of the area for recreation and wildlife habitat must be sacrificed. The principal commitment of resources would be depletion of thermal energy and alteration of the vegetative cover, together with irretrievable expenditures of capital and labor for construction of installations. (Fernandez-Florida)
W76-03925

FINITE ELEMENT SOLUTIONS TO TWO GROUNDWATER FLOW PROBLEMS - ONE INCLUDING DISPERSION AND THE OTHER THE INFLUENCE OF ELECTRO-OSMOSIS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-03962

POLLUTANT MOVEMENT TO GROUND WATER FROM SWINE WASTE LAGOONS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-03973

GROUNDWATER CONTAMINATION CAUSED BY WASTE WATERS GENERATED IN GALVANIZING PLANTS (GALVANUZEMI SZENNYVIZ ALTAL OKOZOTT TALAJVIZSZENNYEZESEK),
For primary bibliographic entry see Field 5B.
W76-03996

4C. Effects On Water Of Man's Non-Water Activities

FLOOD HAZARD PATTERNS OF URBAN DEVELOPMENT IN THE UPPER MIDWEST,
Western Illinois Univ., Macomb. Public Policy Research Inst.
For primary bibliographic entry see Field 4A.
W76-03627

HANLON CREEK ECOLOGICAL STUDY, PHASE A.
Guelph Univ. (Ontario). Centre for Resources Development.
For primary bibliographic entry see Field 5G.
W76-03629

FREEWAY STORM RUNOFF WILL BE CLARIFIED,
Michigan Dept. of State Highways, and Transportation, Lansing.
For primary bibliographic entry see Field 5D.
W76-03718

USE OF SATELLITE DATA IN URBAN HYDROLOGIC MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W76-03748

PERFORMANCE OF PENNSYLVANIA HIGHWAY DRAINAGE INLETS,
Lehigh Univ., Bethlehem. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-03750

STORMFLOWS AND EROSION AFTER TREE-LENGTH SKIDDING ON COASTAL PLAIN SOILS,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
B. P. Dickerson.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 5, p 867-868, and 872, September-October 1975. 3 fig, 6 ref.

Descriptors: *Storm runoff, *Erosion, *Mississippi, Forest soils, Regression analysis, Trees, Storm surge, Forestry, Coastal plains, Soils, Slope protection, Soil erosion, Forests, Lumbering.
Identifiers: Tree-length skidding, Forest floor, Hardwood logs.

A 2-year study in northern Mississippi defined increases in stormflow and sediment from areas disturbed by upslope skidding of tree-length logs with a rubber-tired skidder. On 20 slopes, stormflow volumes averaged 28.4 cm, or about 11% of the total rainfall. Soil loss averaged 14.8 kg per trail in the first year but diminished rapidly as herbaceous vegetation occupied bared soil. In contrasts, stormflows from the undisturbed plots averaged only 2.8 cm for the two years. Stormflow from undisturbed plots were fairly uniform, but those from skid trails varied considerably. Sediment production during the study averaged 16.56 kg per trail with a standard error of + or - 3.04 kg. Seventy-five percent of the total sediment loss occurred during the first 6 months, and sediment yields were highest in May and July, when rainfall was above normal monthly averages. Results of this study were not applicable to all stands Coastal Plain soil. (Roberts-ISWS)
W76-03756

ACID ROCK IN THE GREAT SMOKIES: UN TICIPATED IMPACT ON AQUATIC BIOTA ROAD CONSTRUCTION IN REGIONS OF S FIDE MINERALIZATION,
Oak Ridge National Lab., Tenn. Environme Sciences Div.
For primary bibliographic entry see Field 5C.
W76-03770

RELATIONSHIPS BETWEEN PRECIPITAT STREAM WATER CHEMISTRY, VEGETATION FOR THE BOWL, A FORES WATERSHED IN NEW HAMPSHIRE,
New Hampshire Univ., Durham. Inst. of Na and Environmental Resources.
For primary bibliographic entry see Field 4D.
W76-03875

STREAM QUALITY IN RELATION TO DRAINAGE IN COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-03900

THERMODYNAMIC CONSTRAINTS METAL SOLUBILITIES IN A STREAM FECTED BY MINE DRAINAGE, BONA COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-03901

RAINFALL-RUNOFF RELATION REDWOOD CREEK ABOVE ORICK, CAL NIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2A
W76-03903

SUMMARY OF HYDROLOGIC COND AND EFFECTS OF WALT DISNEY W DEVELOPMENT IN THE REEDY CRE PROVEMENT DISTRICT, 1966-73,
Geological Survey, Winter Park, Fla.
A. L. Putnam.
Florida Bureau of Geology, Tallahassee, R Investigations No 79, 1975. 115 p, 30 fig, ref.

Descriptors: *Hydrologic data, *Land ment, *Environmental effects, *Water *Runoff, Florida, Basic data collections, water, Surface waters, Streamflow, analysis, Evaluation, Construction, Urba Recreation facilities.
Identifiers: *Walt Disney World(Fla).

The Reedy Creek Improvement District an area of about 43 sq mi in southwest O northwest Osceola Counties, Fla. Before ment of Walt Disney World began (mid- of this tract was scrubby flatlands an Walt Disney World facilities now (1974 slightly less than 10 percent of the area. ic data are available for most of the area year period July 1967-June 1973, w records starting before July 1967. T tiometric surface of the Floridan aquifer Lake has declined 8 feet on the average five percent of the decline is attributed use in the RCID; the remaining dec tributed to deficient rainfall since th began in March 1966. The discharge of the RCID has increased. However, the conditions were changing locally as th ment of the area progressed. Becau change, the magnitude and seasonal dis any eventual change in streamflow ca

urately appraised until additional data are obained after the development has stabilized. In eneral, the quality of the water in the area is ood. The dissolved-solids concentration is low ith surface water generally less than 90 mg/litre nd with groundwater generally less than 150 g/litre. Color ranges from 0 to 40 units for roundwater and from 10 to 600 units for surface ater. There is no indication of a detrimental efect on water quality from the influence of evelopment. (Woodard-USGS)
76-03908

D. Watershed Protection

ANLON CREEK ECOLOGICAL STUDY, HASE A.
uelph Univ. (Ontario). Centre for Resources evelopment.
or primary bibliographic entry see Field 5G.
76-03629

ULL RUN SAFE YIELD STUDY,
or primary bibliographic entry see Field 4A.
76-03792

FFECT OF FLOW RATE AND CANOPY ON ILL EROSION,
gricultural Research Service, Oxford, Miss. edimentation Lab.
or primary bibliographic entry see Field 2J.
76-03861

PPENDIX 12, SHORE USE AND EROSION, REAT LAKES BASIN FRAMEWORK STUDY.
eat Lakes Basin Commission, Ann Arbor, chigan, Public Information Office.
r primary bibliographic entry see Field 2J.
76-03866

PPENDIX 18, EROSION AND SEDIMENTAON, GREAT LAKES BASIN FRAMEWORK UDY.
eat Lakes Basin Commission, Ann Arbor, chigan, Public Information Office.
r primary bibliographic entry see Field 2J.
76-03870

LATIONSHIPS BETWEEN PRECIPITATION, REAM WATER CHEMISTRY, AND GETATION FOR THE BOWL, A FORESTED ATERSHED IN NEW HAMPSHIRE,
w Hampshire Univ., Durham. Inst. of Natural Environmental Resources.
W. Martin.
S. Thesis, May 1975. 67 p, 20 fig, 10 tab, 54 ref.

scriptors: *Forest management, *New mpshire, Precipitation(Atmospheric), Streams, rients, Forest watersheds, Hydrology, Geolo- Soils, Vegetation, Biology, Meteorology, systems, Water chemistry, Chemistry of cipitation, On-site investigations.
ntifiers: *White Mountains(NH), *The vl(NH), Stream water chemistry, Wood ducts, Stream chemistry, Ionic balance.

study was designed to study the flow of plant ient elements through a watershed covered by rthern hardwood forest that has had negligible an disturbance. Research was conducted in Bowl Natural Area located in the White Moun- National Forest near Wonalancet, New mpshire. Precipitation was measured by a netk of rain gages established for the study and amflow was estimated from a nearby USFS am gage. Nitrate, sulfate, bicarbonate, ride, inorganic phosphate, calcium, magnesi- sodium, potassium, pH, ammonium, electrical ductivity, dissolved silica, and turbidity were sured on stream water samples and composite precipitation collected once every two weeks from May 1973 through September 1974. A survey of the woody vegetation was conducted during the summer of 1974 to estimate the biomass and species distribution within the area. A mature steady state forest covers the 607 ha tract with a mixture of old (300 yr) and young (30 yr) stands of predominantly tolerant northern hardwoods and conifers. There were no noticeable seasonal trends in the nutrient outputs. This was significant for nitrate, indicating that the steady state forest did not increase its uptake of nitrate during the growing season as would be expected in a highly productive forest. The summer nitrate concentrations in the stream water were the same as those of the dormant winter season. (Roberts-ISWS)
W76-03875

WATER AND WATERCOURSES--FEDERAL JURISDICTION--FEDERAL COMMON LAW DETERMINES OWNERSHIP OF RE-EXPOSED NAVIGABLE RIVER BEDS--BONELLI CATTLE CO. V. ARIZONA,
For primary bibliographic entry see Field 6E.
W76-03919

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.
D. L. Sturges.
In: Proceedings, Snow Management on the Great Plains Symposium, July 29, 1975, Bismarck, North Dakota, p 105-117, 6 fig, 3 tab, 2 ref. Research Committee, Great Plains Agricultural Council, Publication No 73.

Descriptors: Surface runoff, *Suspended load, *Bedload, *Water quality, *Melt water, *Intermittent streams, *Snowmelt, *Sagebrush, Water yield, Watershed management, Snow, Snowpacks, Hydrographs.
Identifiers: *Oversnow flow, Big sagebrush, Suspended sediment.

Oversnow flow, the movement of snowmelt water across the snow surface, primarily in intermittent drainages, has important hydrologic implications. Maximum flow rates on a big sagebrush watershed were increased three to five times in years with the flow and snowmelt runoff, expressed as a percent of winter precipitation, was four times as large. Water is quickly conveyed off the watershed so that soil moisture recharge and deep seepage losses are minimized. The most important factor triggering oversnow is probably a constriction in flow at the ground-snow interface since intermittent drainages do not have a preformed channel to carry water. Oversnow flow develops when prolonged, high snowmelt rates occur at the beginning of snowmelt. Daily melt exceeded 1 inch per day when snow covered sagebrush plants and was greater than 2 inches per day when the snow level was within sagebrush foliage. Increased sediment movement accompanied oversnow runoff events. Suspended sediment concentration reached 862 ppm while oversnow flow was occurring in comparison to levels that are less than 20 ppm in years lacking the flow. Annual coarse sediment deposition was also highest in years with the flow and ranged from 8 to 179 cu ft per sq mile for all years. Deposition was 6 and 12 times greater than the average rate for years without oversnow runoff. (Forest Service)
W76-03965

SEDIMENT TRANSPORT FROM BIG SAGEBRUSH WATERSHEDS,
Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.
D. L. Sturges.
In: Proceedings, Watershed Management Symposium, August 11-13, 1975, Logan, Utah, Utah State University, p 728-738. 3 fig, 6 tab, 4 ref.

Descriptors: *Sediment transport, *Sediment discharge, *Suspended load, *Water quality, Streams, *Sedimentation rates, Suspension, *Sagebrush, Deposition, *Bedload, Watershed management, Range management, Wyoming.
Identifiers: Suspended sediments, Bedload deposition, *Oversnow flow, Big sagebrush.

Suspended sediment and bedload transport are discussed for two watersheds vegetated with big sagebrush that have perennial flow. Average suspended sediment content of water during the 1974-75 winter was 6 ppm and ranged from 1 to 28 ppm. Suspended sediment levels increased sharply as snowmelt runoff began, peaked at about the same time as maximum runoff, but then fell much faster than streamflow recession. Suspended sediment exceeded 100 ppm on 13 days during snowmelt runoff in 1974 and had a maximum value of 399 ppm. Suspended sediment content exhibited a diurnal fluctuation similar to the diurnal fluctuation in streamflow volume. Sediment levels gradually declined through the 1974 summer period from about 20 ppm in late June to less than 10 ppm by October. Both suspended movement and runoff rates have been greatest during oversnow flow, a unique hydrologic phenomenon. The suspended sediment concentration reached 862 ppm at one watershed during oversnow flow in comparison to a usual level less than 20 ppm during snowmelt runoff. Annual bedload deposition ranged from 0.09 to 3.88 cu m per sq km and was highest in years with oversnow flow. The sagebrush watersheds had annual bedload depositions that were similar to rates reported for timbered, subalpine lands. (Forest Service)
W76-03966

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

TENTATIVE REFERENCE METHOD FOR THE MEASUREMENT OF GROSS ALPHA AND GROSS BETA RADIOACTIVITIES IN ENVIRONMENTAL WATERS.
National Environmental Research Center, Las Vegas, Nev. Technical Support Lab.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 063, $10.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-680/4-75-005, June 1975. 17 p, 5 ref, append. EPA 1HA327..

Descriptors: *Pollutant identification, Measurement, Methodology, Radioactivity, Water chemistry, *Radiochemical analysis, Calibration, *Radioactive wastes, *Standards.
Identifiers: Radiation chemistry, Quality assurance.

A tentative reference method for the measurement of gross alpha and gross beta radioactivities in environmental waters is described. Samples of environmental water sources are collected, preserved by acid treatment, and aliquots of the samples are evaporated to dryness in a counting dish and counted for alpha and beta activity. Counting efficiencies for sample aliquots are read from curves prepared from counting data of prepared standards, using a known quantity of cesium-137 and 0-10 milligrams of evaporated water dissolved solids per square centimeter of counting dish area for gross beta, and a known quantity of americium-241 and 0-5 milligrams of evaporated water dissolved solids per square centimeter of counting dish area for gross alpha. Results are reported in pCi/liter. (EPA)
W76-03528

APPLICATION OF PULSE POLAROGRAPHY TO POLLUTANT ANALYSIS,
Princeton Applied Research Corp., Princeton, N.J.

H. Siegerman, G. O'Dom, and J. Flato.
In: Electrochemical Contributions to Environmental Protection, Theodore R. Beck, et al, editors. The Electrochemical Society, Inc., Princeton, New Jersey, 1972, p 76-87. 12 fig, 1 tab, 12 ref.

Descriptors: *Analytical techniques, *Heavy metals, Polarographic analysis, *Pollutant identification, Cadmium, Lead, Zinc, Copper, Industrial wastes, Electrodes, Organic compounds, Electrochemistry.
Identifiers: *Pulse polarography, *Differential pulse anodic stripping, Pottery glaze, Blood.

The differential pulse anodic stripping method (DPAS) is an electroanalytical technique for determination of small voltammetry. The amalgam metals are reoxidized to their component ions with waveforms which minimize charging current distribution and allows application of signal-processing techniques to minimize extraneous noise. This combination increases the sensitivity over anodic stripping voltammetry. Zinc and copper determinations in a prepurified acetate buffer were more sensitive with the DPAS method. When zinc and cadmium were quantitated by the standard additions method, a linear relationship existed between peak heights and concentration. The DPAS method can be used to determine zinc, lead, and cadmium in pottery glaze; lead in plant effluent; heavy metals (copper, lead, cadmium, and zinc) in tap water; and lead in blood after perchloric-sulfuric acid digestion. With the Kemula-type hanging mercury drop electrode, sensitivities in ppb can be achieved with only a few minutes deposition time. The use of wax-impregnated graphite electrodes is described. The differential pulse polarographic technique can also be used to analyze objectionable organics; it is rapid, sensitive, and reproducible for heavy metal analysis at very low concentrations. (Buchanan-Davidson--Wisconsin)
W76-03529

THE SQUARE-WAVE POLAROGRAPH AND ITS APPLICATION TO THE DETERMINATION OF HEAVY METALS IN THE ENVIRONMENT,
Iowa Univ., Iowa City. Dept. of Chemistry.
E. B. Buchanan.
In: Electrochemical Contribution to Environmental Protection, Theodore R. Beck, et al., editors. The Electrochemical Society, Inc., Princeton, New Jersey, 1972, p 88-98. 2 fig, 9 ref. EPA AP 00900-1.

Descriptors: *Polarographic analysis, *Heavy metals, *Analytical techniques, Instrumentation, Electric currents, Electrolytes, Lead, *Iowa, Halides, Electrodes, Chemical properties, Electrochemistry, *Pollutant identification.
Identifiers: *Square-wave polarography, *Iowa River(Iowa).

Square-wave polarography can measure 1 ppb metal ions directly, but the instrumentation is complex. The method for measuring current is inefficient, cell resistance must be minimized, and the electric signal decreases as chemical species causing the electrical signal decrease. New instrumentation has helped reduce these problems. Compared to conventional d-c polarography, square-wave polarography has greater sensitivity, increased selectivity, a common base line between successive peaks, and deaeration can sometimes be omitted. Of the electrolytes evaluated for lead determination in Iowa River water at Iowa City, greater sensitivity was observed when halides were used. An interfering hump in the polarogram disappeared when sodium fluoride was used, but etching was a problem. A mixture of sodium fluoride (to provide reversibility for electrode reactions) and perchlorate (for conductivity) at an optimum pH of 3 helped. The amplitude and frequency of the applied square-wave, gate position, and duration affected measurement sensitivity. The single parameter controlling sensitivity was the time delay between square-wave transition and gate opening. Current increased as a function of time for five minutes after deaeration ceased, then remained constant. River samples showed a large increase in lead in the spring when snow from city streets dumped on the frozen river melted. (Buchanan-Davidson--Wisconsin)
W76-03530

GULF GENERAL ATOMIC PHENOL MONITOR,
Gulf General Atomic, Inc., San Diego, Calif.
B. D. Epstein.
In: Electrochemical Contribution to Environmental Protection, Theodore R. Beck, et al., editors. The Electrochemical Society, Inc., Princeton, New Jersey, 1972, p 99-107. 6 fig, 2 ref.

Descriptors: *Phenols, *Industrial wastes, *Monitoring, Electrochemistry, Spectrophotometry, Water quality, Analytical techniques, Hydrogen ion concentration, Effluents, *Pollutant identification.
Identifiers: *Phenol monitor, Oil refineries.

The phenol monitor developed by Gulf General Atomic uses electrochemical and spectrophotometric principles to measure phenols in waste water on a semicontinuous basis. The spectral shift of samples undergoing a pH change was used to detect and quantitate different phenols. Above pH 12, ionized phenols like those in industrial wastes had absorption maxima about 290 nm. In protonated phenols, the maximum shifted to shorter wavelengths. Protonation was complete below pH 2. Phenol absorbance was monitored at 290 nm, when the pH was changed from 12 to 2. The angle beam optical system with regulated light source was self-cleaning. A self-cleaning electrochemical cell controlled the pH. Pre-electrolysis filters removed insoluble particulate matter. The monitor, electrolysis cell, timing of automatic sequences controlling pH, data acquisition, and analysis are described. The phenol concentration in San Diego tap water from the Colorado River was satisfactory despite high calcium and magnesium concentrations. Hydroxybenzene (phenol), p-aminophenol, p-methoxyphenol, 2,5-xylenol, 3,4-xylenol, and p-chlorophenol were measured. Phenol was determined in synthetic waste waters and refinery effluents. In field tests, some plugging of the inlet filter was encountered. When sample flow was good, instrument response was reasonably stable. Results were higher than those obtained by the 4-aminoantipyrine method. (Buchanan-Davidson--Wisconsin)
W76-03531

ANALYSIS OF SEWAGE LAGOON BIOMASS WATER SOLUBLE VITAMINS BY MICROBIOLOGICAL TECHNIQUES,
Findlay Coll., Ohio. Div. of Natural Sciences.
N. M. Bakaitis.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 110-115. 15 ref, 2 tab.

Descriptors: *Sewage lagoons, *Vitamins, *Biomass, Aerobic treatment, Municipal wastes, Vegetation, Water pollution sources, Proteins, Nutrients, Carbohydrates, Lipids, Sweet corn, Barley, Alfalfa, Sugar beets, Soybeans, Vitamin B, Calcium, Zinc, Manganese, Lagoons, Water pollution sources, Feeds, Chemical analysis, Byproducts, Aerated lagoons, *Pollutant identification.
Identifiers: Riboflavan, Biotin, Choline, Niacin, Pantothenic acid, Thiamine, Vitamin B(6).

Biomass from the Deshler, Ohio, aerobic sewage lagoon compares favorably in protein, fat, carbohydrate, mineral, and vitamin content with commercial feeds, such as alfalfa, ear corn, dried barley, sugar beet pulp, and solvent-extracted soybean hulls. The biomass contains more riboflavin and comparable amounts of biotin, choline, niacin, patothenic acid, and thiamine, and less amounts of vitamin B(6) than the commercial feeds. The mineral content of the biomass also compates favorably with these feeds being higher in calcium and zince but lower in manganese. (See also W76-03541) (Witt-IPC)
W76-03550

COLIFORM AND PHYTOPLANKTON STUDIES IN A BRACKISH WATER AQUACULTURE POND FERTILIZED WITH DOMESTIC WASTEWATER,
Washington Univ., Seattle.
R. F. Donnelly, and T. T. Inouye.
In: Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 404-411. 4 fig, 7 ref.

Descriptors: *Coliforms, *Aquiculture, *Phytoplankton, *Brackish water, *Sewage treatment, Seawater, Bacteria, Aquatic bacteria, Water pollution treatment, Water pollution control, Aquatic plants, Sewage effluents, Pathogenic bacteria, Fertilizers, Nutrients, *Pollutant identification.
Identifiers: Anacystis, Ankistrodesmus.

Samples of coliforms and phytoplankton were taken from an aquaculture pond containing sewage effluent-seawater mixture during two different seasons (April 15 through May 27 and September 27 through October 31). The data appear to support the hypothesis that there is a direct relationship between Anacystis and coliforms. A negative correlation existed for Ankistrodesmus and coliforms. Since previous studies demonstrate that bacteria utilize the organics secreted by phytoplankta and that phytoplankta utilize inorganic nutrients generated from bacterial breakdown of organic materials, it is suggested that there may be a nutrient interrelationship between Anacystis and coliforms. (See also W76-03547) (Witt-IPC)
W76-03568

A SEMIAUTOMATED PROCEDURE FOR THE DETERMINATION OF PHOSPHORUS IN WATER, WASTE WATERS AND PARTICULATES,
New York State Dept. of Health, Albany.
E. Canelli, and D. G. Mitchell.
Water Research, Vol 9, No 12, p 1093-1097, December, 1975. 3 fig, 10 ref, 4 tab.

Descriptors: *Phosphorus compounds, *Water analysis, Analytical techniques, Water, Water(Pollution), Dissolved solids, Phosphorus, Phosphates, Silicates, Water chemistry, Water properties, Colorimetry, Chemical analysis, *Pollutant identification, Water pollution sources.

Improved procedures for the determination of total dissolved phosphorus (TDP), particulate phosphorus (PP), and dissolved inorganic orthophosphate (DP) are described. Organic particulate material is solubilized in 5 normal NaOH and phosphorus compounds are oxidized and mineralized to orthophosphate by persulfate digestion. DP is determined by an improved automated molybdenum blue procedure that does not require sample pH adjustment or a correction for silicate interference in the 0-50 mg Si/liter range. The use of 36-position digestion racks allows TDP or PP samples to be digested in about 1 and 2 hr, respectively. Detection limits in micrograms phosphorus/liter are DP, 2; TDP, 5; and PP, 7. Waste water samples were analyzed for TDP and PP by the nitric acid-sulfuric acid procedure and by the proposed method. There was no significant difference between the two sets of data. (Witt-IPC)
W76-03579

SELECTIVE SEPARATIONS BY REACTION ION EXCHANGE, PART II, PRECONCEN

ION AND DETERMINATION OF COMPLEX RON CYANIDES IN WATERS,
tate Univ. of New York at Binghamton. Dept. of hemistry.
. O. Ramseyer, and G. E. Janauer.
nalytica Chimica Acta, Vol 77, p 133-143, July, 975. 5 tab, 48 ref.

escriptors: *Heavy metals, *Pollutant identifica-n, *Pollutants, *Iron compounds, *Cation change, Water quality, Chemical precipitation, nalytical techniques, Separation techniques, ectrophotometry, Columns, Aqueous solutions. entifiers: *Reactive ion exchange, *Iron cya-les, *Preconcentration, *Hexacyanoferrate, yanide, Copper ions, Ion exchange columns, omic absorption.

w York State law has established 400 ppb as the al amount of hexacyanoferrate(II) and (III) per-ssible in fresh water. Previous methods to mea-re these compounds were not sensitive to the b level or were not reliable due to less than antitative yields. A new method using reactive exchange is described which permits precon-ntration of ppb levels of hexacyanoferrate(II) (III) from aqueous solutions with high efficien- and minimal cost and effort. The in situ cipitation of copper hexacyanoferrate(II) or) preconcentrates the complex cyanides on llow beds of sulfonated cation-exchange resin he copper(II) form. Hydrochloric acid reactive-elutes other cations including concomitant iron cies from the resin bed and, finally aqueous monia reactively releases and elutes the hexa-noferrate(II) or (III) through the formation of copper-ammine complex. Final determination he complex cyanides is performed by atomic orption spectrometry for iron. (Davis-Van-bilt)
6-03583

GANIC COMPOUNDS IN PULP MILL GOON DISCHARGE,
shington Univ., Seattle. Coll. of Forest ources.
. Hrutfiord, T. S. Friberg, D. F. Wilson, and J. Vilson.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as PB-246 900, 0 in paper copy, $2.25 in microfiche. Environ-tal Protection Agency, Report EPA-660/2-75- June 1975. 61 p, 14 fig, 16 tab, 24 ref. EPA 037.

criptors: *Pollutant identification, *Aerated ons, Resins, Acids, Mass spectrometry, *Pulp es, Organic compounds, *Organic acids, ols, Industrial wastes, Waste water treat-t.
tifiers: *Kraft mill effluents, Fatty acids, enes, Sugar acids, Resin acids.

nic compounds entering and leaving kraft aerated lagoons have been identified and rmined quantitatively. The compounds found terpenes and related low B.P. materials, resin fatty acids, phenols and sugar acids. The ter-s, resin and fatty acids are similar to those nt in the wood specie being pulped. Some ter-s, phenols and sugar acids are produced dur-he pulping reactions. About 8 ppm total ter-s were found in the lagoon influent and 1 ppm ss were in the effluent. Alpha-Terpineol was major compound entering the lagoon and hor the main terpene in the effluent. The total acid concentration entering the lagoon was pm with 0.6 ppm leaving. Fatty acids were r both entering and leaving the lagoon. Sugar were found at about 100 ppm total entering, were usually completely eliminated in the n. Control of terpenes can be done by in-ss steam stripping and the other compounds e partially controlled by in-plant spill contain-. (EPA)
03631

TRITIUM FRACTIONATION IN PLANTS,
Environmental Monitoring and Support Lab., Las Vegas, Nev. Monitoring Systems Research and Development Div.
J. C. McFarlane.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 839, $3.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-680/4-75-006, June 1975. 11 p, 2 tab, 21 ref. EPA 1FA083.

Descriptors: *Tritium, *Radioisotopes, Radioactivity, Hydroponics, *Pollutant identification, Plant physiology, Transpiration, Path of pollutants, Alfalfa, *Radiochemical analysis.
Identifiers: Radiochemistry.

Alfalfa plants were hydroponically grown in environmental growth chambers in which they were continuously exposed to tritium. All segments of the environment were in equilibrium with respect to the specific activity of tritium. The tritium content in plant organic matter was about 22 percent lower than in the plant free water or rooting solution. Under conditions of low transpiration, there was a higher concentration (about 1.8) percent of tritium in the leaves than in the stems and rooting solution. This is thought to represent the result of fractionation during transpiration. (EPA)
W76-03632

DEVELOPMENT OF A BIOLOGICAL MONITORING NETWORK - A TEST CASE - SUITABILITY OF LIVESTOCK AND WILDLIFE AS BIOLOGICAL MONITORS FOR ORGANOPHOSPHORUS CONTAMINANTS,
Environmental Monitoring and Support Lab., Las Vegas, Nev. Monitoring Systems Research and Development Div.
W. W. Sutton, and L. L. Salomon.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-246 062, $4.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-680/4-75-003, June 1975. 38 p, 6 fig, 8 tab, 8 ref. EPA F11082, ROAP 22 ACS.

Descriptors: *Monitoring, *Bioindicators, Networks, *Organophosphorus compounds, *Utah, Pesticide residues, Analytical techniques, *Pollutant identification, Cytological studies, Wildlife, Livestock, Enzymes.
Identifiers: *Biological monitoring, Monitoring networks, Animals monitors, Warburg manometric method, Red cells, Erythrocyte acetylcholinesterase.

A review was conducted of a DPG monitoring network which is designed to establish baseline erythrocyte acetylcholinesterase (AChE) levels in the fauna of West Central Utah, and to evaluate the suitability of using livestock and wildlife as biological monitors for organophosphorus contaminants. Wildlife species sampled during these DPG efforts included the antelope ground squirrel, the ORD Kangaroo rat, the deer mouse, and the black-tailed jackrabbit. Individual blood samples from these wildlife species as well as samples from cattle and sheep were collected and analyzed for red cell AChE activity. The analytical method employed was based on the Warburg manometric technique. Results indicate that the range of red cell AChE activity values for both livestock and wildlife species is sufficiently compact to allow observation of the depression of enzymic activity that would result from organophosphorus exposures. Controlled studies have shown that, following exposure to organophosphorus chemicals, the red cell activity recovers in an essentially linear fashion. Additive effects resulting from the simultaneous exposure to military agent VX and either toxic plants or commercial pesticides are discussed. (EPA)
W76-03633

RADIOCHEMICAL METHODOLOGY FOR DRINKING WATER,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
H. L. Krieger.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-245 406 $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/4-75-008, September 1975. 48 p, 7 fig. 2FH120 (1HA327; ROAP 24-AAK; Task 005).

Descriptors: *Chemical analysis, Methodology, *Potable water, *Pollutant identification, Quality control, Measurement, *Radiochemical analysis, Analytical techniques.

A laboratory manual of radiochemical procedures has been compiled and edited for use in the analysis of specific radionuclides in drinking water; nuclides for whom the Environmental Protection Agency recommended maximum contaminant levels in its interim drinking water standards. In addition to gross activity analyses, the procedures for 134/137Cs, 131I, 226/228Ra, 89/90Sr, 3H and 40K were evaluated by replicate testing to determine the method capabilities and minimum detection levels. The results indicate that the sensitivity of these procedures is at least a factor of ten greater than the present required limits. Appended is information on reagent preparation and suggested sources for purchasing special equipment. (EPA)
W76-03635

STUDIES ON VAPORIZATION AND HALOGEN DECOMPOSITION OF METHYL MERCURY COMPOUNDS USING GC WITH A MICROWAVE DETECTOR,
Oak Ridge National Lab., Tenn.
Y. Talmi, and R. E. Mesmer.
Water Research, Vol 9, No 5/6, p 547-552, 1975. 4 fig, 6 tab, 18 ref.

Descriptors: *Chromatography, *Mercury, Analytical techniques, Chemical analysis, *Pollutant identification, Vapor pressure, Distribution patterns, *Gas chromatography.
Identifiers: *Methyl mercury, *Microwave detector, *Distribution coefficients.

Gas chromatography with the sensitive microwave emission spectrometric detector has been used to study the distribution of (CH3)2Hg between air and water and the vapor pressures above CH3HgX compounds and their solutions where x designates Cl, Br, I, or OH. The distribution coefficient for (CH3)2Hg is 0.31 at 25 deg C and 0.15 at O deg C, which shows that it will be readily lost to the atmosphere above natural waters. Vapor pressures of CH3HgC1 and Ch3HgOH are 11 and 5.6 microns of Hg respectively at 22 deg C. Very rapid photochemical reactions of CH3HgX with 12 or Br2 at very low concentrations were discovered in water at room temperature and this could serve as a means for the destruction of CH3HgX. Also, the reaction with I2 is an important potential source of error in analytical procedures utilizing the high extractability of the CH3HgI species. (Hoyle-Vanderbilt)
W76-03638

DETERMINATION OF VOLATILE PHENOLS IN WASTEWATERS OF CHEMICAL PHARMACEUTICAL INDUSTRIES, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledouatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii Baku (USSR).
Y. Y. Lur'e, M. I. Shemeryankina, and V. G. Mitereva.
Khim-Farm Zh, 8(8): 54-55, 1974.

Descriptors: *Pollutant identification, *Phenols, *Industrial wastes, *Solvent extractions, Analytical techniques, Chemical analysis.
Identifiers: *Pharmaceutical industry.

To determine volatile phenols in wastewaters of the chemical-pharmaceutical industry the following method is proposed: a sample of the wastewater (10-50 ml depending on the presumed content of phenols) is acidified with 1.5-5 ml of concentrated hydrochloric acid. The solution obtained is extracted with ether (3 times with 15 ml each). All ether extracts are combined ansd washed with 30 ml of a 5% solution of sodium bicarbonate. Then the ether extract is treated with 30 ml of a 5% solution of sodium hydroxide in a 20% solution of sodium chloride. The water layer is removed. The operation of extracting phenols from the ether extract is repeated 3 times. The alkaline aqueous solutions are combined. The volatile phenols are determined in the mixture obtained with 4-aminoantipyrine by the known method.--Copyright 1975, Biological Abstracts, Inc.
W76-03639

EXTRACTION OF METALS BY NEUTRAL SULFUR-CONTAINING EXTRACTANTS, PART I, O-ISOPROPYL-N-ETHYLTHIOCARBAMATE,
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
I. V. Seryakova, G. A. Vorobiova, A. V. Glembotsky, and Y. A. Zolotov.
Analytica Chimica Acta, Vol 77, p 183-190, July, 1975. 6 fig, 4 tab, 17 ref.

Descriptors: *Heavy metals, *Pollutant identification, *Separation techniques, Chemistry, *Solubility, Analytical techniques, Mercury, Copper, Gold, Halides, Radioisotopes, Trace elements, Carbamate pesticides, Organic compounds.
Identifiers: Silver, Thallium, Selenium, Distribution coefficients, Thiocarbamates, Flotation reagents.

Results are presented of an investigation of the extraction of many elements by one of the effective flotation reagents and collectors, 0-isopropyl-N-ethylthiocarbamate (IPETC). A 0.05 M solution of IPETC in choroform was used to extract solutions of metal nitrates or sulfates labeled with radioactive isotopes. Mineral acids were added before extraction in known amounts. The solutions were mechanically shaken for 5 minutes or longer, the phases were separated, and radioactivity measured in a scintillation counter. The extractions of Cu(I,II), Ag, Au(III), Zn, Cd, Hg(II), Ga, In, Tl(I,III), Bi, MO(VI), W(VI), Se(IV,VI), Te(IV), Fe(III) and Co were investigated in the presence of Cl(-), Br(-), I(-), NO3(-), ClO4(-), and SO4(--) ions. The degree of extraction and distribution coefficients are given for the various elements. The effect of acidity on extraction and the time needed for equilibrium is discussed. Results show that by manipulating different halide-sulfuric acid mixtures with an IPETC solution in chloroform, the metals may be extracted with high selectivity. (Davis-Vanderbilt)
W76-03641

LEAD ISOTOPIC SYSTEMATICS AND AGES OF ARCHAEAN ACID INTRUSIVES IN THE KALGOORLIE-NORSEMAN AREA, WESTERN AUSTRALIA,
Australian National Univ., Canberra. Research School of Physical Sciences.
For primary bibliographic entry see Field 2K.
W76-03642

HEAVY METAL BINDING COMPONENTS OF RIVER WATER,
Ottawa Univ. (Ontario). Dept. of Biology.
S. Ramamoorthy, and D. J. Kushner.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1755-1766, 1975. 4 fig, 4 tab, 24 ref.

Descriptors: *Heavy metals, Chemistry, *Analytical techniques, *Chemical properties, Filters, Particle size, Screens, Ions, Biochemistry, Ionization, Water quality, *Pollutant identification, Rivers, Canada.
Identifiers: *Binding capacity, Fulvic acid.

Ion-specific electrodes were used to measure the heavy metal (HM) binding capacity of river waters near Ottawa. Binding capacity was measured in unfiltered water and in water passed through filters retaining particles (0.45 micrometers) and macromolecules of molecular weight (MW) 45,000, 16,000, and 1,400. In the most studied water samples, almost all of the Hb2+-binding ability passed through the smallest filter. Filters of different pore sizes retained substantial fractions of the binding ability towards other HM ions. Binding strengths and conditional binding constants were calculated for each HM ion and low MW Ottawa River water components. Binding in Ottawa River water was not due to HCO3- or CO32- ions; in the Rideau Canal, and probably other bodies of water, such ions caused a substantial amount of binding. After complete ashing of Ottawa River water and reconstitution with deionized water almost all the HM binding ability was lost; thus, an organic compound(s) is responsible for binding. The binding pattern towards different HM ions of fulvic acid isolated from soil was different from that of unfiltered or filtered Ottawa River water. Fulvic acid was not the sole binding component of this water. These experiments suggested a way of assessing the importance of fulvic acid and other humic substances in HM binding by natural waters.(Klein)
W76-03651

UPTAKE AND LOSS OF PETROLEUM HYDROCARBONS BY THE MUSSEL, MYTILUS EDULIS, IN LABORATORY EXPERIMENTS,
National Marine Fisheries Service, Seattle, Wash.
R. C. Clark, Jr., and J. S. Finley.
Fishery Bulletin, Vol 73, No 3, p 518-515, 1975. 8 fig, 1 tab, 20 ref.

Descriptors: *Mussels, *Oil spills, *Organic compounds, *Absorption, Path of pollutants, Analytical techniques, Pollutant identification, Water pollution effects, Oil pollution.
Identifiers: *Mytilus edulis, *Petroleum paraffin hydrocarbons, No. 2 fuel oil, No. 5 fuel oil, Elimination, Bioaccumulation, Tissue analysis.

Petroleum paraffin hydrocarbons from No. 2 and No. 5 fuel oils were rapidly incorporated into the mussel, Mytilus edulis, in a laboratory system that simulated tides. The mussels were exposed to levels of petroleum hydrocarbons from a surface slick similar to those encountered in the environment after an oil spill. After 14 days in clean seawater, the mussels had lost most of the hydrocarbons from the fuel oils; however, detectable traces of the No. 2 fuel oil still remained after 35 days. Preliminary results from these laboratory studies confirmed previous studies of pollutant uptake and loss following actual oil spills. (Klein)
W76-03656

THE DETECTION OF BACILLUS SPORES IN THE CONTEXT OF HYGIENIC WATER EVALUATION,
R. H. W. Schubert.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med, 160(2): 155-162, 1975.

Descriptors: *Pollutant identification, Pseudomonas, *Bacteria, Public health, *Spores, Nutrient requirements, Bioindicators, Self purification, Water pollution sources, Soils, Groundwater.
Identifiers: *Bacillus.

Due to their differentiated nutritional requirements the Bacillus spp. found in large number in the waste matter and the upper layers of the soil and consequently in the surface water cannot mu tiply in biotopes of low nutritive content. How ever, they spread to these areas as spores and a of extraordinary tenacity if not eliminated. In th ground water and within the range of its utilizatio they are an indicator of the degree of purificatio or contamination of the water with waste produc or surface impurities; their number does not d pend on the phase of self-purification (e.g number of colonies) in the sense of the degrad tion of remaining substances still utilizable pseudomonads. The concentration of spores of t Bacillus spp. in the surface water ranged fro 1000-10,000/50 ml water. In undisturbed grou water 0-5/50 ml were found; in filtered grou water from near the banks and in such water posed to surface contamination 1000/50 ml more were found; in the direction of infiltrati (proportional to the purification effect in t ground) decreasing numbers of spores of Bacil spp. were detectable. In areas of subsequent g mination of the water supply and water utilizat no multiplication of spores of Bacillus spp. w observed, provided no additional contaminat occurred.--Copyright 1975, Biological Abstrac Inc.
W76-03662

CURRENT DPD METHODS FOR THE DETE MINATION OF RESIDUAL HALOGEN CO POUNDS AND OZONE IN WATER (AKTUAL METODY DPD DLA ZWYAZKO CHLOROWEOW I OZONU POZOSTALYCH WODZIE),
A. T. Palin.
Roczniki Panstwowego Zakladu Higieny, Vol No 4, p 470, 1975.

Descriptors: *Ozone, *Halogens, *Analy techniques, Chlorine, Water analysis, *Pollu identification.
Identifiers: *DPD method.

The DPD (N,N-diethyl-p-phenylene-dian method of determining the concentration residual effective chlorine in water has modified. It permits determination of residua fective chlorine in the presence of CO2 chlo bromine, and ozone. The author recently ha cluded glycine (C2H5NO2) which immedi forms chloramine acetate with free chlorine does not bind ClO2. In the prescene of monochloracetic acid reacts with DPD. Fo titration of iron content, ferro-ammonium s of a known titer added to the sample can ac the chlorites developing as a result of ClO2 r tion. This process interferes with the esta ment of the first end point of titration. In or prevent this, 0.2 g of disodium edetate is a For the determination of bromine and broam the presence of free chlorine, glycine mu added at the beginning of the analytical proce in order to bind free chlorine. For ozone mination, excess KI, before or simultane with DPD, is added. The addition of glycine the first phase of the analysis, however, le immediate decomposition of ozone which p determination of effective chlorine after s sively adding Ki and DPD to the solution. summary, the manner in which special dete tions are carried out and what reagents hav used were indicated. (Tallert-FIRL)
W76-03693

QUALITY CONTROL STARTS AT THE P
Environmental Protection Agency, Kansa Mo. Region VII.
W. J. Keeffer.
The American City and County, Vol 90, N 74-75, October, 1975.

Descriptors: *Monitoring, *Water quality *Pollutant identification, *Analytical tech Laboratory tests, Sampling, Industrial Waste water treatment, Chemical analysis analysis, Personnel, Water pollution source

Environmental Protection Agency has evalu-
the need for better effluent sampling
iques, with a greater frequency. As a result
e Water Pollution Control Act Amendments,
has been an increased demand for waste
chemistry data on point source discharges.
nt sampling technology uses flow propor-
compositing techniques, and the variations
mpler performance and manual sampling
iques mask actual changes in the charac-
cs of the waste water. Possible sources of
in manual flow compositing or discrete grab
es include: not shaking the discrete sample
compositing, miscalculating correct sample
es when determining discharge rates from
ential functions based on hydraulic head
rements, and misreading of graduated cylin-
For industrial waste sampling, it is recom-
d that two compositors (one with discrete
jars on an hourly cycle, the other taking
ts at more frequent intervals) be used.
even ideal circumstances, flow rates cannot
asured more precisely than plus or equal to
Also, the individuals responsible for surveys
mple collection can intentionally or uninten-
y manipulate apparent waste water chemis-
aracteristics. There is a need for more
l and supervised personnel to collect sam-
d to perform analysis. Adequate monitoring
ht control on sampling techniques, laborato-
cedures and equipment, and data interpreta-
urged. (Kramer-FIRL)
3694

CITY GRADIENT CALIBRATION OF
EST EQUIPMENT,
nmental Sciences and Engineering, Inc.,
ille, Fa.
ii, H. E. Hudson, and J. E. Singley.
an Water Works Association Journal, Vol
10, p 553-557, October, 1975. 9 fig, 2 tab, 11

tors: *Velocity, *Calibrations, *Testing
ures, Equipment, Analytical techniques,
*Pre-treatment(Water), Turbulence,
law, Impellers, Laboratory tests, Labora-
quipment, Fluid mechanics, *Pollutant
cation.
ers: *Jar-test equipment, Velocity
t, Threshold speeds, Drag coefficients.

-test procedure is widely used for calibrat-
simulating water pre-treatment processes
laboratory, but no standard for this
re exists. The mixing intensities, ex-
as the mean gradient, G, for four jar-test
rations were determined throughout the
le speed range. The fluid condition in
ixing and flocculation basins is always tur-
and at common jar-test speeds, laminar
nditions may occur. Minimum threshold
equired to produce turbulence were deter-
Stokes' theory relates the velocity gradient
power dissipation function, which can be
ed by calculating the torque on the rotor
The turbulent gross drag coefficient and
ous gross drage coefficient can be calcu-
m G and the speed of the rotors. An al-
approach that was developed used the
s number and the Power number. The
and the speed of revolution of the rotors
asured in the laboratory. Values for G, the
coefficients, the Reynolds number and
er number were then calculated. Results
four configurations studied showed that
depend on the projected areas of the im-
nd not on their shape. Variations of the
of the impellers from the breaker bottoms
hange the energy input. The energy input
ase with the addition of baffles, but it was
regardless of baffle size or geometry with
npeller. The minimum threshold speed for
ce was 100 rpm for unbaffled systems and
n with baffled systems. (Pinto-FIRL)
95

AUTOMATIC SEWER SAMPLING SYSTEM MONITORS FOR SPILLS,
Union Carbide Corp., Chicago, Ill.
J. F. Galluzzo.
Pollution Engineering, Vol 7, No 9, p 73, September, 1975. 1 fig.

Descriptors: *Water quality control, *Water pollution, *Industrial wastes, *Spills, Monitoring equipment, *Pollutant identification.

An automatic sampling and monitoring system is described which can be installed in plant sewers to detect any accidential spills or abnormal discharges in a production plant. The monitoring system can be used to monitor sewers which carry storm water, surface run-off water, or cooling water. The pH, conductivity, and total organic carbon are reported for each stream. Specially designed floats are suspended in the flowing streams of the sewers which draw off a uniform continuous sample. The sample is pumped by self-priming pumps into flow-through type pH and conductivity sensors and into a total carbon analyzer. The flow-through sensors for pH and conductivity are cleaned periodically by ultrasonic cleaners. The water sample to the carbon analyzer is filtered; the filter is cleaned as needed. High and low alarms are provided for pH. High alarms are provided for conductivity and total carbon. When a alarm is activated, a grab sample of the abnormal stream is taken immediately. The sample is then analyzed to determine the specific pollutant present. The system permits closer control of unplanned spills and discharges. (Orr-FIRL)
W76-03696

PERFORMANCE OF AUTOMATIC WASTE-WATER COMPOSITIONS,
Environmental Protection Agency, Region VII, Kansas City, Missouri.
D. J. Harris, and W. J. Keefer.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Purdue University, Lafayette, Indiana, p 213-222. 7 tab, 1 ref.

Descriptors: *Sampling, *Data collections, *Water quality, Equipment, *Automation, *Waste water treatment, Treatment facilities, Monitoring, Analytical techniques, Chemical analysis, Water analysis, Sewage treatment, Pollutant identification, Measurement.
Identifiers: Water quality samplers, Water quality data.

Discrepancies in water quality data have been noted which appeared to result from variations in automatic waste water sampling equipment performance. Four studies were conducted to compare the water chemistry data of samples collected concurrently with various makes and models of commercially available samplers. Analysis were performed on samples from the Richards-Gebaur AFB, the Thersea Street Sewage Treatment Plant in Lincoln, Nebraska, the Ashland, Nebraska, Sewage Treatment Plant, and the KAW Point Sewage Treatment Plant in Kansas City, Kansas. Each comparison indicated significant raw waste data discrepancies resulting from differences in performance of sampling equipment or manual techniques. The implication is that waste water chemistry characteristics and facility removal effectiveness can be manipulated intentionally or unintentionally by selection of sampling equipment. High-vacuum samplers produced more representative samples and should be used on raw municipal waste waters or wastes with significant levels of heavy suspended material. Current sampling methodologies and equipment must be refined to improve data reproducibility and accuracy. (Kramer-FIRL)
W76-03698

FORMATION OF ORGANOCHLORINE COMPOUNDS FROM THE CHLORINATION OF A MUNICIPAL SECONDARY EFFLUENT,
North Texas State Univ., Denton. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5D.
W76-03699

OXYGEN DEMAND PARAMETERS: CORRELATION OF BOD5 WITH COD,
Sangamon State Univ., Springfield, Ill.
K. G. Janardan, and D. Schaeffer.
Water and Sewage Works, Vol 122, No 10, p 62-65, October, 1975. 8 fig, 3 tab, 11 ref.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, Statistics, Analytical techniques, Laboratory tests, Correlation analysis, Statistical methods, *Oxygen demand, *Pollutant identification.
Identifiers: Correlation coefficient, BOD5.

Examinations of stream and effluent BOD5 and COD measurements have indicated that monitoring for COD can replace measurements for routine screening. It is necessary to test for BOD5 only if the sample COD exceeds a specified maximum. Statistical analyses were performed on 113 stream samples and 713 effluent samples gathered in Illinois Environmental Protection Agency laboratories from January 1971 to December 1972. A statistical correlation was established between COD and BOD5. The regression coefficients are not a technique for calculating BOD5 values from COD data. The establishment of the correlation permits the substitution for BOD5 by COD after corresponding control limits for COD are determined at a chosen level of probability. If the COD value exceeds the chosen limit, then a BOD5 test should be performed because the legal limits are based on BOD5. (Orr-FIRL)
W76-03701

DETERMINATION OF AMMONIA-, NITRATE-, AND ORGANIC NITROGEN IN WATER AND WASTE WATER WITH AN AMMONIA GAS-SENSING ELECTRODE,
Invercargill Southland Regional Water Board (New Zealand).
L. R. McKenzie, and P. N. W. Young.
The Analyst, Vol 100, No 1194, p 620-628, September, 1975. 7 tab, 10 ref.

Descriptors: *Nitrogen, *Pollutant identification, *Water analysis, Ammonium compounds, Electrodes, Ion exchange, Measurement, Sampling, Organic compounds, Water pollution, Water quality, Waste water treatment.
Identifiers: Ammonium ion selective electrode, Ammonia-nitrogen, Nitrate-nitrogen, Organic nitrogen.

An Orion ammonium ion selective electrode has been used for the determination of ammonia-nitrogen, nitrate-nitrogen, and organic nitrogen on both waters and effluents. Nitrate-nitrogen could be measured as ammonia-nitrogen after reduction in acid conditions, with the use of an alkali of higher concentration than normal to achieve a pH of 12. A simple method for reducing nitrate-nitrogen to ammonia-nitrogen was employed, with nascent hydrogen produced in situ by the action of acid on Devarda's alloy. It was found that the presence of metals producing insoluble hydroxides when the alkali pH adjuster was added to the sample interferred with the permeability of the membrane and affected the response time of the electrode. However, this interference could be avoided with the use of EDTA in large amounts. By using 1.0 M EDTA as a complexing agent, the measurement of ammonia-nitrogen compounds in sea water was simplified. The ammonia electrode was also used to determine organic nitrogen in waste water and water samples. The electrode does not produce any improvements over a conventional method. However, because organic

nitrogen may be determined in conjunction with ammonia- and nitrage-nitrogen in the same sample, the advantage lies in using a single measuring technique for the three types of compounds. (Kramer-FIRL)
W76-03702

A SIMPLIFIED PHOSPHORUS ANALYSIS TECHNIQUE,
Wisconsin Univ., Madison. Water Chemistry Lab.
S. J. Eisenreich, R. T. Bannerman, and D. E. Armstrong.
Environmental Letters, Vol 9, No 1, p 43-53, 1975. 1 fig, 3 tab, 10 ref.

Descriptors: *Phosphorus, *Chemical analysis, *Pollutant identification, Digestion, Oxidation, Absorption, Analytical techniques.
Identifiers: Total phosphorus, Total dissolved phosphorus, Dissolved reactive phosphorus, Molybdenum blue.

Common techniques for the determination of total phosphorus (TP) and total dissolved phosphorus (TDP) depend on a digestive or oxidative procedure followed by a type of molybdenum blue procedure. These techniques are complicated and time consuming. A simplified and more sensitive procedure has been developed to determine TP, TDP and the dissolved reactive phosphorus (DRP). The neutralization, transfer and dilution steps needed in the other procedure are eliminated. A single digestive reagent and a single mixed reagent for color formation are required. The absorbance of the resultant solution is measured at 882 nm. It is also possible to measure the absorbance at a secondary peak at 710 nm with a 30% reduction in sensitivity, if the higher wavelength is not available. This method results in a 70% decrease in analysis time, a decrease in the amount of glassware needed and a 30% increase in sensitivity. It can be applied to samples containing phosphorus in the range of 2 to 1000 micrograms P/liter and can be extended by a factor of five by using sample aliquots of as little as 5 ml. Centrifugation of samples containing large quantities of suspended matter following digestion is recommended. (Pinto-FIRL)
W76-03705

A MODIFIED PROCEDURE FOR THE DETERMINATION OF NITRATE IN SEDIMENTS AND SOME NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
B. K. Afghan, and J. F. Ryan.
Environmental Letters, Vol 9, No 1, p 59-73, 1975. 3 fig, 2 tab, 12 ref.

Descriptors: *Nitrate, *Sediments, *Natural streams, Chemical analysis, Colorimetry, Chemical precipitation, Acidity, *Pollutant identification, Waste water(Pollution), Humic acids, Analytical techniques.
Identifiers: Shipek bucket sampler.

It has been found that existing methods for determining nitrate in sediments and some natural waters do not give precise and accurate results due to the presence of sulfide and high concentrations of humic acid substances. A procedure for the removal of these substances prior to nitrate analysis by a colorimetric method is described. The sulfide in the acidic medium is first removed by copper and the humic acid - copper complexes are precipitated by neutralizing the pH of the solution. Sediment samples were collected by a Shipek bucket sampler, freeze dried to remove water, ground to fine particles and stored. The sulfide and the humic acid were removed by the successive addition of copper sulfate to precipitate the sulfide and potassium hydroxide to neutralize the solution and precipitate the copper and humic acid. Colorimetric analysis was then performed on the resulting solution to determine nitrate concentration. Samples were spiked with known amounts of nitrate to test the procedure and results were consistently near the 100% recovery level compared to low recovery levels for samples not treated. Detailed analyses, conducted to determine what substances in waste water interfered with the process and therefore had to be removed, showed that calcium, iron, manganese and sulfide ions in addition to humic acid interfered. The procedure has been tested on a wide variety of natural water samples, sediments, clays and sands. (Pinto-FIRL)
W76-03706

ANALYSIS FOR AQUEOUS NITRATES AND NITRITES AND GASEOUS OXIDES OF NITROGEN BY ELECTRON CAPTURE GAS CHROMATOGRAPHY,
Monsanto Research Corp., Dayton, Ohio. Dayton Lab.
W. D. Ross, G. W. Buttler, T. G. Duffy, W. R. Rehg, and M. T. Wininger.
Journal of Chromatography, Vol 112, p 719-727, October, 1975. 3 fig, 2 tab, 7 ref

Descriptors: *Nitrates, *Nitrites, *Nitrogen, *Gas chromatography, *Chemical analysis, *Pollutant identification, Aromatic compounds, Nitrogen compounds, Calibrations, Solubility, Urine, Potable water, Instrumentation.
Identifiers: *Electron capture detectors, Nitrobenzene, Nitration.

Because of the toxicity and reactivity of nitrogen oxide gases and aqueous soluble nitrites and nitrates, analysis methods are of great concern. A gas chromatographic method of analysis based on the nitration of an aromatic compound is described. If benzene is used in combination with sulfuric acid, potassium nitrate, potassium nitrite or nitric acid as reagents, nitrobenzene will be produced. The advantages of this process are: nitrobenzene is relatively stable and can be stored before sampling; many different species of nitrogen based compounds can be analyzed using the same apparatus and almost the same analysis procedure; nitrobenzene can be detected with great sensitivity with an electron capture detector (ECD); and only very small samples are needed beacuse of the great sensitivity. Analyses were conducted to determine the reactivity of benzene with nitrate, and the GC properties of nitrobenzene. The chromatograms were found to be relatively free of interfering peaks, indicating that the samples were of high purity. Solubility studies showed that nitrobenzene separated between two layers of benzene and sulfuric acid. This is a necessary consideration in the calibration procedures, of which three were developed. Tests performed on efficiencies of conversion showed that potassium nitrate gives the highest efficiency, nitric acid the next highest and potassium nitrite the lowest efficiency. Tests were also made to determine the concentrations of nitrates in human urine and drinking water from a city water supply. (Pinto-FIRL)
W76-03707

TRACE ANALYSIS OF ORGANIC VOLATILES IN WATER BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY WITH GLASS CAPILLARY COLUMNS,
Alabama Univ., University. Dept. of Chemistry.
W. Bertsch, E. Anderson, and G. Holzer.
Journal of Chromatography, Vol 112, p 701-718, October, 1975. 4 fig, 4 tab, 70 ref.

Descriptors: *Volatility, *Organic compounds, *Gas chromatography, *Mass spectrometry, Analytical techniques, Chemical analysis, *Pollutant identification, Gases, Organic compounds, Potable water, Waste water(Pollution), Adsorption, Aromatic compounds, Industrial wastes, Water treatment.
Identifiers: *Gas capillary columns, Halogenated hydrocarbons, Gas-Phase stripping, Desorption.

The increasing use of water from polluted so for drinking purposes has made it necessa monitor that water from all aspects. Haloge hydrocarbons have recently been found in ing waters. A short review of current san procedures and some of the options are disc Processes that have been applied in the pa clude liquid-solid adsorption, batchwise an tinuous liquid-liquid extraction, freeze-d distillation, vacuum evaporation, gas- stripping and reverse electroosmosis. The many factors present which can intorduct matic errors into these systems. The alt method described is based on gas-phase str Organic substances which partition in th phase are continuously removed from the They are concentrated and adsorbed onto a polymer. Seaprations were carried out by highly efficient glass capillary columns. Th ple is transferred into a gas chromatog column by a process using heat desorptio capacity of the adsorbent was determined number of model substances found in water pounds less volatile than benzene were retained, with some exceptions. Samples included both tap water and untreated High incidences of halogenated hydroc were found in drinking water but not in in or stream waters, supporting the hypothe they are introduced in the water tre process. Samples from a recreational lake high concentrations of volatiles. Samples dustrial waters showed camphor relate stances and terpene derivatives. (Pinto-FIR W76-03708

STUDIES ON ANION ACTIVE SURFAC I. DETERMINATION OF ANION ACTIV FACTANTS IN NATURAL AND WATERS USING CLEANUP BY COLUMN CHROMATOGRAPHY (I KAIMEN KASSERZAI NI KANSURU K (DAI 1 PO)),
R. Takeshita, and H. Yoshida.
Eisei Kagaku, (The Journal of Hygienic try), Vol 21, No 4, p 209-215, 1975. 1 fig, 4

Descriptors: *Surfactants, *Water *Analytical techniques, *Pollutant identi Colorimetry, Ion exchange.
Identifiers: Anion-active surfactants, M Blue method.

Anion-active surfactants, both in natura and waste waters, may be determined by method. The method consists of cleanu Amberlite XAD2 column and determin colorimetry using Methylene Blue. A sam be directly passed through the column; th is then washed with 0.05 N sodium hydro tion. Surfactants taken up by the resin with a mixture of acetone and aqueous The acetone is then evaporated from th and the surfactants are determined as so dodecyl)benzenesulfonate by the Methy method. Even when surfactants are co very low levels, they may be concent measured by loading a large amount of t over the column. The average recovery 4-(2-dodecyl)benzenesulfonate from w tified at levels of 50 and 100 microg 100.5%. (Kramer-FIRL)
W76-03710

ANALYTICAL METHODS FOR COMPOUNDS IN SEWAGE EFFLUEN
Water Pollution Research Lab., (England).
Notes on Water Pollution, No 70, 1975. 1 fig, 4 tab, 32 ref.

Descriptors: *Analytical techniques, compounds, *Sewage effluents, Se fluents, *Pollutant identification, Sew ment, Waste water treatment, Gas raphy, Mass spectrometry, Infrared

ility, Computers, Freeze drying, Vacuum
g, Resins, Instrumentation.
fiers: Gas-liquid chromatography, High-
ure liquid chromatography, Infrared spec-
opy, Thermionic detectors, Microwave-
a detectors, Electron capture detectors,
space analysis, Liquid-liquid extraction,
distillation, Foam concentration.

n quantities of organic matter are resistant
degradation due to conventional treatment
sses. Broad characterizations of sewage ef-
s are useful in pointing toward the type of
d analysis that is necessary. Sensitive
ical techniques for detection of organic
in effluents are discussed. The organic con-
ts of an effluent must first be concentrated
small volume so that they fall within the
of sensitivity of the detection apparatus.
methods being used include head-space
is, liquid-liquid extraction, freeze drying
ed by liquid-solid extraction, vacuum
ation, steam distillation, foam concentra-
d concentration by synthetic resins. Two
ds of separation are gas-liquid chromatog-
(GLC) and high-pressure liquid chromatog-
(HPLC). GLC is useful for separating
substances, which make up 30 to 40% of
anic carbon present in sewage effluent. De-
developed for GLC analysis include elec-
pture detectors, thermionic detectors and
ave-plasma detectors. HPLC can be used
remaining 60 to 70% of the organic matter
non-volatile. However, it has not reached
ne stage of advanced development as has
nd there are no comparable detectors. Two
erization techniques used are infrared (IR)
scopy and mass spectroscopy (MS). Both
e techniques can be coupled with GLC
s, providing rapid accumulation of vast
ies of spectral data. GLC and MS can also
bined with computer systems as can other
ental analytic methods. (Pinto-FIRL)
711

ULTURAL RUNOFF POLLUTES SUR-
WATERS, PART I,
Dakota State Univ., Brookings. Dept. of
gineerig.
arms, P. Middaugh, J. N. Dornbush, and J.
ersen.
nd Sewage Works, Vol 122, No 10, p 84-
ber,' 1975. 2 tab.

tors: *Water pollution sources, *Pollutant
ation, *Coliforms, Agricultural runoff,
, Sampling, Data collection.
ers: Fecal coliforms, Fecal streptococci,
t sources.

t sources of water pollution from urban
gricultural lands, forests, and grazing areas
en recognized. In this study, data were
d pertaining to surface runoff from
ral land. Information was collected on the
of bacteriological indicator organisms
the runoff and how these densities related
quality criteria for the receiving waters. A
onditions were natural and uncontrolled.
st common bacteriological test for water
te water samples is total coliform. How-
cause these organisms may result from
al matter such as grains or plants, other
s, fecal coliform (FC) and fecal streptoc-
S), were used. A FC/FS ratio has been
determine whether pollution in a water
s used from human or animal sources.
re collected from seven sites in eastern
akota on surface runoff from snowmelt
fall. Flow measuring equipment, water
orders, and automatic samplers were used
ite. Composite samples were made from
ete samples that had been automatically
. These were stored at 4 C and tests were
d about 12 hours after initial collection by
ler. Results of the tests are evaluated in
d part of this article. (Kramer-FIRL)
19

CONTRIBUTIONS TO THE CHEMISTRY OF ANTARCTIC SNOW: DETERMINATION OF TRACE ELEMENTS AT THE PPB LEVEL BY ATOMIC ABSORPTION SPECTROMETRY,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2C.
W76-03728

CONTRIBUTION TO THE CHEMISTRY OF ANTARCTIC SNOW: TRACE ELEMENT DOSAGE BY NEUTRON ACTIVATION,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2C.
W76-03729

QUALITY VARIATIONS OF THE MEKONG RIVER AT PHNOM PENH, CAMBODIA, AND CHEMICAL TRANSPORT IN THE MEKONG BASIN,
Universite Pierre et Marie Curie, Paris (France), CNRS, Laboratoire de Geologie Dynamique.
J. P. Carbonnel, and M. Meybeck.
Journal of Hydrology, Vol 27, No 3/4, p 249-265, December 1975. 5 fig, 6 tab, 17 ref.

Descriptors: *Water quality, River basins, *Dissolved oxygen, *Temperature, *Hydrogen ion concentration, *Conductivity, *Ions, *Asia, Discharge(Water), Sediment transport, Chemical properties, Sampling, Variability, Dissolved solids, *Pollutant identification.
Identifiers: *Mekong River(Cambodia), Phnom Penh(Cambodia), Southeast Asia.

Daily samples were collected between January 1961 and December 1962, and pH, temperature, dissolved oxygen and conductivity were measured. Monthly analyses of water quality were conducted, and the results were (in mg/l): SiO2, 8.85; Ca(2+), 14.2; Mg(2+), 3.2; Na(+), 3.6; K(+), 2.0; Cl(-), 10.5; SO4(2-), 3.8; HCO3(-), 57.9; NO3(-), 1.1. The chemical quality of Mekong waters was found highly variable (total ionic content ranged from 60 to 190 mg/l). As usual, concentrations C decrease with increasing discharge Q according to the relation C=aQ to the bo power, with -1 less than b less than 0. To this general trend are superimposed secondary cycles, due to the Annamitic tributaries, that are responsible for important scatterings of concentrations. These processes can only be stuided day by day, but 12-18 analyses per year seemed to be sufficient to compute reliable weighted means. The total mineral transport to the ocean was estimated to 59,500,000 t/year. It appeared that mineral dissolved matter transported by the Mekong river originates mainly from the lower basin. This region has an average dissolved transport of 75t/sq km/year in spite of its mid-altitude relief. If this value is taken as an average for Southeast Asia (10,000,000 sq km), this region could contribute up to 30% of the world dissolved input to the ocean. (Lardner-ISWS)
W76-03745

A COMPARATIVE EVALUATION OF THE WEISS SATUROMETER,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
D. H. Fickeisen, M. J. Schneider, and J. C. Montgomery.
Transactions of the American Fisheries Society, No 4, p 816-820, 1975. 2 fig, 2 tab, 6 ref.

Descriptors: *Methodology, Design, *Gas chromatography, *Instrumentation, *Analytical techniques, Saturation, Gases, Pressure, Comparative productivity, Laboratory tests, *Pollutant identification.
Identifiers: *Saturometer, *Weiss saturometer, *Dissolved gas.

The Weiss saturometer, an instrument which measures dissolved gas tensions, was evaluated and compared with gas chromatographic apparatus. With vigorous shaking the saturometer equilibrated with dissolved gas tension after fifteen to twenty-five minutes in moderately supersaturated water. Both methods (gas chromatography and the Weiss saturometer) appeared to offer advantages in specific applications, and the method of choice for dissolved gas analysis remained dependent on individual requirements. The need for conscientious operation of the saturometer by an experienced operator was apparent (Klein)
W76-03774

TOTAL POPULATION DENSITY OF CRUSTACEA AND AQUATIC INSECTA AS AN INDICATOR OF FENTHION POPULATION OF RIVER WATER,
Plant Protection Research Inst., Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W76-03779

IDENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
H. E. Guard, L. Hunter, and L. H. Di Salvo.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 4, p 395-401, 1975. 1 tab, 1 fig, 7 ref.

Descriptors: Water pollution sources, Laboratory tests, Analytical techniques, Methodology, *Water pollution effects, Environmental effects, *Separation techniques, *Crabs, Commercial shellfish, Fuels, *Oil pollution, Oil, Water pollution, Solubility, Organic compounds, Phenols, Chromatography, Spectroscopy, *Pollutant identification, *California, Bays.
Identifiers: Pachygrapsus crassipes, *San Francisco Bay(Calif), *Bunker fuel.

The composition of the seawater extract of a bunker fuel, methodology for obtaining the seawater-soluble fraction of bunker fuels and significance of the dissolved oil to a crab species are reported. Major water-soluble components were identified as acetophenone, 2-phenyl-2-propanol, phenol and cresols. This investigation was designed to simulate an oil spill of bunker fuel in San Francisco Bay in January, 1971. The shore crab (Pachygrapsus crassipes) population in and around San Francisco Bay was decimated. It was suggested that this was due to an adverse effect of the water-soluble components on this and other commercially important crabs. (Katz)
W76-03781

V-NOTCH WEIR AIDS IN METERING TREATED EFFLUENTS,
Clontz (J.R.) Associates, Tampa, Fla.
J. M. Clontz.
Water and Sewage Works, Vol 122, No 10, p 86-87, October, 1975. 2 fig.

Descriptors: *Flow measurement, *Weirs, *Effluents, *Sewage treatment, *Waste water treatment, Treatment facilities, Sewers, Equipment, Monitoring, Water pollution control, Waste treatment, Waste disposal, *Pollutant identification, Rural areas.
Identifiers: V-notch weirs.

V-notch weirs have been used to meter effluents from small on-site waste treatment plants in developing rural areas. In Broward County, Florida, such treatment facilities are being replaced with sewers. At present, however, many small treatment plants are located unobtrusively on private properties. In this county, polluters are

liable for a civil penalty of up to $5000 per day. Thus, an accurate measure of effluent flow from the small plants is necessary. An effluent flow measuring system was developed by the American Meter Division of the Singer Company. The system provides a daily chart record of flow in gallons per hour, with indication of variations in the flow rates and a cumulative digital read-out of total effluent volume. Thus, periodic readings show total flow per day or week. The measurement is made by an open channel v-notch weir, including a recorder. Installations of the weir and recorder are illustrated. When flow rates exceed the range of the v-notch weir app.lication, other equipment such as rectangular weirs, Parshall flumes, and Palmer-Bowlus flumes may be substituted. (Kramer-FIRL)
W76-03790

'THAMESWATER' HELPS IN THE FIGHT FOR A CLEANER RIVER,
C. Dover.
Surveyor, Vol 146, No 4345, p 12, September 19, 1975.

Descriptors: *Water quality control, *Rivers, *Aquatic life, Sludge disposal, *Pollutant identification, Dissolved oxygen, Powerplants, Water temperature, Alkalinity.
Identifiers: *Thames River(G.B.), Water authorities.

The Thames Water Authority has commissioned a new research vessel to monitor the Thames River water quality. Called the 'Thameswater', this launch will observe the effect that the five sludge disposing vessels are having on the river. In the past year it has been found that the Thames is relatively clean and that fears that it may become anaerobic are unnecessary. The typical pattern of dissolved oxygen for the river is high at Richmond, declining to a minimum at Crossness, and rising to almost fully saturated at Southend. It was also found that the Thames has been on the average two degrees cooler than in past years, probably due to a reduction in electricity consumption and thus a lower load of heat pollution from power stations. The 'Thameswater' is used by teams from the Thames Water Authority chemical laboratories and biological research facilities. It can automatically monitor the river temperature, its chloride content (for salinity), and alkalinity and ammonia and nitrate levels. An abundance of aquatic life and clean seaweeds have indicated that the river is generally healthy. (Kramer-FIRL)
W76-03791

NITRATES IN WISCONSIN GROUND WATER,
Wisconsin State Lab. of Hygiene, Madison.
For primary bibliographic entry see Field 5B.
W76-03803

ORGANICS IN DRINKING WATER, PART I-LISTING OF IDENTIFIED CHEMICALS,
Ames Lab., Iowa.
G. A. Junk, and S. E. Stanley.
Report No IS-3671, July, 1975. 84 p, 1 tab, 94 ref, append.

Descriptors: *Potable water, *Organic compounds, *Pollutant identification, Water supply, Public health, Water analysis, Reviews, Water sources.

A tabulation of the organic chemicals which have been identified in potable water and in other water which might be used as raw water sources for public drinking water is presented. The compilation was prepared by reviewing all available reports of organics in water. The table is an alphabetical listing of 423 organic chemicals of which 325 have been reported in drinking waters, and 394 have been specifically identified. Molecular weights, empirical formulas, structural information and literature citations are also given. The identified organic contaminants in drinking water are usually present at less than 10 micrograms/liter (10 ppB). Most of the identified organic chemicals with boiling points above 150C are present in drinking water at concentrations less than one microgram/liter (one ppB). (Orr-FIRL)
W76-03850

APPENDIX 7, WATER QUALITY, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
1975. 228 p, 40 fig, 78 tab, 32 ref.

Descriptors: *Great Lakes Region, *Water quality, *Administrative agencies, *Illinois, *Indiana, *Michigan, *Minnesota, *New York, *Ohio, *Pennsylvania, *Wisconsin, *Lake Superior, *Lake Michigan, *Lake Huron, *Lake Erie, *Lake Ontario, Water quality standards, Water pollution sources, Data collections, River basins, Regulation, Water pollution control, Waste water treatment, Federal government, State governments, Treatment facilities, Construction costs, Water quality control.

Many Federal, State, and local programs exist for the purpose of maintaining or enhancing water quality in the Great Lakes Basin. Principal Federal programs include those relating to comprehensive programs, technical assistance, grant programs, enforcement, Federal installations, Refuse Act permit programs, water hygiene, environmental impacts, pesticide programs, radiation programs, research, and monitoring. Interstate water quality standards have been adopted by all Great Lakes Basin States, but many water quality problems of varying degrees of severity exist in all of the Lake basins. A substantial part of the wastewater treatment needs and the resultant investments will occur during the 1970 to 1980 period, and many of the investment requirements occur in the planning subareas or river basin groups containing large population concentrations or industry. In addition to municipal and industrial wastewater control problems, other existing and potential problems involve wastes from watercraft, runoff from urban and rural land, including residues from application of chemicals, fertilizers and pesticides, thermal pollution, and disposal of dredged materials. The report summarizes water quality conditions and trends in relation to established water use designations and potential future uses. It also identifies the nature, location, and gravity of water quality problems, and defines actions needed to maintain or improve the quality of the waters of the Basin. Also found in the report are general cost estimates for carrying out major components of the required action program. (Humphreys-ISWS)
W76-03864

STREAM QUALITY IN RELATION TO MINE DRAINAGE IN COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-03900

THERMODYNAMIC CONSTRAINTS ON METAL SOLUBILITIES IN A STREAM AFFECTED BY MINE DRAINAGE, BONANZA, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-03901

EVALUATION AND PROPOSED STUDY OF POTENTIAL GROUND-WATER SUPPLIES, GALLUP AREA, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W76-03905

HYDROLOGY OF MALHEUR LAKE, HARN COUNTY, SOUTHEASTERN OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 4A.
W76-03906

WATER RESOURCES DATA FOR LOUISIA WATER YEAR 1975.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W76-03907

HARFORD COUNTY GROUND-WATER FORMATION: WELL RECORDS, CHEM QUALITY DATA, AND PUMPAGE,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 7C.
W76-03912

WATER QUALITY IN RHODE RIVER SMITHSONIAN INSTITUTION PIER NEA NAPOLIS, MARYLAND, APRIL THROUGH DECEMBER 1973,
Geological Survey, Edgewater, Md. Ches Bay Center
R. L. Cory, J. M. Redding, and M. M. McCu
Available from the National Technical In tion Service, Springfield, Va 22161, as PB-2 $4.50 in paper copy, $2.25 in microfiche. Resources Investigations 10-74, January 1 p, 7 fig, 1 tab.

Descriptors: *Water quality, *Rivers, *Ma *Estuaries, *Water properties, Chemical a Data collections, Water temperature S Turbidity, Dissolved oxygen, Hydrogen i centration, Water levels, Tidal effects.
Identifiers: *Rhode River estuary(Md).

Water temperature, salinity, turbidity, di oxygen, pH and water level data were ously monitored at the Smithsonian Insti pier Rhode River, Md. Data consist of g daily maximum and minimum values sum by week to give weekly averages and extre a table which gives daily maxima and Temperatures showed an overall range fro 32.6 deg C. The water temperature data successively warmer winters. Salinity ran 1.05 to 14.03 parts per thousand. In Ju salinity dropped markedly as fresh wa tropical storm Agnes entered the Rho from the Susquehanna River via the Che Bay. Turbidity was usually low, averag 14 Jackson Turbidity Units; however dur and early summer of 1972, values averag 23 Jackson Turbidity Units. This increa bidity was due to the high Susquehan flows during that period. Extremes of ranged from about 5 to 80 Jackson Turbid Dissolved oxygen ranged from 0.0 to grams per litre. Large daily changes in c dicated a high state of biological m Values of pH ranged from 6.8 to 10.1 changes coincided with oxygen chan dominated water levels had an overall r (1.8 metres) and a mean tidal range of metres). (Woodard-USGS)
W76-03914

METHODS FOR COLLECTION AN SIS OF AQUATIC BIOLOGICA MICROBIOLOGICAL SAMPLES,
Geological Survey, Menlo Park, Calif.
K. V. Slack, R. C. Averett, P. E. Greeso G. Lipscomb.
Available from Supt of Docume Washington, D.C., 20402, Price $2.85. of Water-Resources Investigations, Chapter A4, 1973. 165 p, 29 fig, 2 tab, 6

Descriptors: *Water sampling, *Wat *Methodology, *Biological *Microbiology, Sampling, Preservati cal techniques, *Pollutant identificatio

U.S. Geological Survey series of manuals on
niques describes procedures for planning and
cuting specialized work in water-resource in-
igations. Chapter A4 of Book 5 contains
hods used by the U.S. Geological Survey to
ect, preserve, and analyze waters for their
ogical and microbiological properties. Among
topics discussed in Part 1 are aquatic habitats
communities, biological sampling and sam-
g statistics, and use of the microscope. The
stical procedures are accompanied by exam-
. Part 2 consists of description of 30 individual
hods, including those for bacteria, seston,
rophyll, diatoms, phytoplankton, zooplank-
periphyton, primary productivity,
rophytes, benthic invertebrates and fish and
r aquatic vertebrates. Each method is sum-
zed, and the application, interferences, ap-
tus, reagents, collection, analysis, calcula-
, reporting of results, precision, and
ences are given. Part 3 consists of a glossary.
ddard-USGS)
-03915

NOLIC ACIDS AS INDICATORS OF POL-
ION WITH LIQUID MANURE. A METHOD
THEIR DETECTION,
cy of Environmental Protection, Charlotten-
Denmark. Fishery Lab.
mp.
r Research, Vol 8, p 889-894, 1974. 3 tab, 8

riptors: *Pollutant identification, *Water pol-
n, *Farm wastes, Analytical techniques,
ols, Liquid wastes.
ifiers: *Phenolic acids, *Pollution indicators,
d manure.

investigation is concerned with the develop-
of a method to detect illegal liquid manure
arges. The method can be used to measure or
t water pollution. The investigation falls into
arts: (1) To find substances which are suita-
dicators of liquid manure. (2) To develop an
tical method for the detection of such sub-
es and test its application. M-hydroxybenzoic
m-hydroxyphenylacetic acid and m-hydrox-
ylpropionic acid in liquid manure occur in
derable quantities. They provide a sensitive
tical method for the detection of liquid
re is thin-layer chromatography on cellulose.
leveloped chromatograms are rendered visi-
spraying with diazotized p-nitroaniline. By
ethod the minimum detectable amounts of
henolic acids are approximately 0.01 ug.
nell-East Central)
03979

OMATOGRAPHIC DETERMINATION OF
TITUENTS IN ETHERAL EXTRACTS
INDUSTRIAL WASTE WATERS (DEL
TITUENTI L'ESTRATTO ETEREO DI
E INDUSTRIALI),
retti, I. Marsella, and B. M. Petronio.
vista Italiana Delle Sostanze Grasse, Vol 51,
p 66-69, February, 1974. 4 fig, 1 tab, 11 ref.

ptors: *Waste water treatment, *Industrial
, *Pollutant identification, Analytical
ques, Chromatography, Chemical analysis,

iers: Thin-layer chromatography, Animal
egetable oils, Mineral oils, Silica gel plates.

l, vegetable, and mineral oil constituents of
ial waste waters can be quantitatively
ined. This is accomplished by a type of
yer chromatography using silica gel plates.
nixture of chloroform and benzene was em-
as elution. The purpose was to assay com-
s of ethereal extracts in industrial waste
(Murphy-FIRL)
3998

5B. Sources Of Pollution

STOP LEACHATE PROBLEMS,
Lenard Engineering, Storrs, Conn.
M. Dilaj, and J. F. Lenard.
Water and Wastes Engineering, Vol 12, No 10, p 27-30, 40, October 1975. 4 fig, 1 tab.

Descriptors: *Leaching, Leachate movement, Ion exchange, Subsurface investigation, Observation wells, Water pollution, Water pollution sources.

Controlling leachate is one of the most important aspects of sanitary landfilling. Refuse decay starts out as an aerobic process but gradually develops into an anaerobic process. Water of decomposition is generally negligible except in highly putrescible organic wastes. Such wastes should be mixed with more stable materials before being placed in a landfill. The moisture content of the refuse will vary due to the type of storage practices, temperature, amount of precipitation, and type of refuse. When leachate leaves the site, the composition will depend on the amount of dilution obtained from infiltrating precipitation, ground-water flow, and from the physical conditions of the decomposition process. Purification starts in the landfill and continues through the subsurface environment by processes of filtration, ion exchange, adsorption and biological oxidation. Organic pollutants are broken down rapidly; inorganic compounds may migrate long distances. Before a sanitary landfill can be properly designed, geologic and hydrologic information of the proposed site must be accumulated and analyzed. Analysis of the data should include: (1) development of a water table contour map; (2) development of cross-sections through the landfill; (3) determination of the horizontal and vertical ground water flow pattern; (4) determination of the transmissibility of the soils in the saturation zone; (5) determination of approximate velocities in the zone of saturation; and (6) ion-exchange properties of the subsurface environment. The design of a landfill site in Ledyard, Conn. using this approach is described. (Gass-NWWA)
W76-03525

HYGIENIC EVALUATION OF EPOXY COMPOSITIONS INTENDED FOR USE IN WATER SUPPLY, (IN RUSSIAN),
Vsesoyunznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5C.
W76-03561

THE TUXTEPEC PAPER MILL (OAXACA, MEXICO) AND POLLUTION OF THE PAPALOAPAN RIVER (LA FABRICA DE PAPEL TUXTEPEC Y LA CONTAMINACION DEL RIO PAPALOAPAN),
Fabricas de Papel Tuxtepec, S.A., Oaxaca (Mexico).
For primary bibliographic entry see Field 5C.
W76-03577

POTENTIAL EFFECTS OF AQUACULTURE ON INSHORE COASTAL WATERS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W76-03585

HOW NOW BROWN COW: REGULATION OF FEEDLOT POLLUTION IN WISCONSIN,
Harvard Law School, Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-03590

HANLON CREEK ECOLOGICAL STUDY, PHASE A.
Guelph Univ. (Ontario). Centre for Resources Development.
For primary bibliographic entry see Field 5G.
W76-03629

MICROBIAL-MALATHION INTERACTIONS IN ARTIFICIAL SALT-MARSH ECOSYSTEMS: EFFECT AND DEGRADATION,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
A. W. Bourquin.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-246 251 $4.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-035, June 1975. 41 p, 16 fig, 8 tab, 30 ref. GBERL 236, 1EA077.

Descriptors: *Biodegradation, Ecosystems, Salt marshes, *Pesticide residues, Bacteria, Microbiology.
Identifiers: Artificial ecosystems, Malathion-microbial interactions, *Malathion degradation.

Malathion is rapidly degraded in vitro by salt-marsh bacteria to malathion-mono-carboxylic acid, malathion-dicarboxylic acid and various phosphotionates as a result of carboxyesterase cleavage. In addition, some expected phosphatase activity produces desmethyl-malathion, phosphotionates, 4-carbon dicarboxylic acids, and corresponding ethyl esters. In a simulated salt-marsh environment, malathion is degraded by the indigenous bacterial community. Numbers of bacteria capable of degrading malathion in the presence of additional nutrients increase in the sediments with increasing frequency of application and in the water column with the increasing level of treatment. Numbers of bacteria which degrade malathion as a sole carbon source are linked to the level of treatment in sediments and the frequency of treatment in the water column; however, these bacteria do no appear to play a significant role in the dissipation of malathion. It is believed that frequency of treatment increases numbers of malathion co-metabolizing bacteria which catalyze a more rapid dissipation of the compound, which results in fewer sole carbon degraders. The disappearance of malathion in the salt-marsh environment is influenced by both chemical and biological degradation; however, at temperatures below 26 C and salinities below 20 0/00, chemical mechanisms appear to be of less importance than biological degradation. (EPA)
W76-03634

STUDIES ON VAPORIZATION AND HALOGEN DECOMPOSITION OF METHYL MERCURY COMPOUNDS USING GC WITH A MICROWAVE DETECTOR,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5A.
W76-03638

IRON BACTERIA AND RED WATER,
Dearborn Chemical Div., Mich.
S. Shair.
Industrial Water Engineering, Vol 12, No 2, p 16-18, March-April, 1975. 4 fig, 7 ref.

Descriptors: *Heavy metals, *Pollutants, *Iron, *Iron bacteria, Water quality, Pipelines, Microbiology, Bacteria, Chemical Precipitation, Microorganisms, Slime, Aerobic bacteria, Corrosion, Manganese.
Identifiers: *Red water, Ferric hydrate, Autotrophic bacteria, *Galionellas, *Chlamydobacteria, Pipe plugging, Iron oxide deposits.

A description is presented of a group of microorganisms known as iron bacteria and the problems they cause in water systems. Iron bacteria are capable of withdrawing iron present in their aqueous habitat and of depositing it in the form of hydrated ferric hydroxide on or in their mucilagenous secretions. They have caused serious

difficulty in industrial and fresh water systems by causing discolored water with an objectionable odor or taste and by clogging pipelines, nozzles, pumps and valves with their deposits. Generally, iron bacteria are autotrophic freshwater organisms with an optimum temperature range of 6 to 25 degrees C and a pH range from 5.5 to 8.2. They oxidize iron or manganese compounds as a source of energy. The bacteria are extremely difficult to grow in the laboratory with the usual cultural media. They can grow in light, shade, or total darkness. Falling in several genera, some are unicellular, either rods or coccoid forms, and some are filamentous. (Davis-Vanderbilt)
W76-03640

THE DESIGN OF A MARINE ENVIRONMENTAL SIMULATION SYSTEM,
Data Industries Inc., East Providence, R. I. Ocean Data Equipment Div.
G. Fain.
IEEE Ocean '75 Record, p 931-939, 1975. 9 fig.

Descriptors: *Design, *Simulation analysis, *Systems analysis, Construction, Methodology, Salinity, Temperature, Oxygen, Turbidity, Physical properties, Laboratory tests, Model studies, *Path of pollutants.
Identifiers: *Flow-through systems.

A marine environmental simulation system was designed to hold, rear and culture marine biota under conditions of controlled temperature, salinity, dissolved oxygen and turbidity. The physical requirements and limitations associated with parameter changes in the flow-through system were examined. A conceptual framework within which to optimally examine and describe the control problem was developed and then used to determine system requirements. Several implementations were developed and a particular configuration was recommended. (Klein)
W76-03643

ENVIRONMENTAL SURVEYS OF OPEN-OCEAN DREDGE MATERIAL DISPOSAL SITES,
Naval Undersea Center, San Diego, Calif.
S. Yamamoto, and J. B. Alcauskas.
IEEE Ocean '75 Record, p 919-925, 1975. 4 fig, 6 tab, 16 ref.

Descriptors: *Waste disposal, *Disposal, *Oceans, Sediments, *Surveys, *Dredging, Wastes, Water pollution sources, Ecosystems, Physical properties, Sampling, Photography, Analytical techniques, Metals, Water quality, Benthic fauna, California, Pacific Ocean.
Identifiers: *Ocean disposal.

Two 100-fathom open ocean disposal sites were monitored to assess the impact of the dumping of dredged materials upon the marine environment. One site was located 35 miles from San Fracisco, Ca. near the Farallon Islands and the other 7.7 miles from San Diego, Ca. Water quality and sediment parameters were measured and photographic surveys of the bottom were made with the Naval Undersea Center's remote-controlled research vehicle CURY III. The objectives of the Farallon site survey were to obtain qualitative descriptions of the physical, chemical and biological environment of the area and of the general release pattern of dredged materials. Although the material was desposited unevenly over the deposition area, most fell directly below the path of the hoppers. The purpose of the San Diego site survey was to monitor a previously unused dump site before, during and after dumping. Results of the predump survey showed the physical-chemical conditions of the area to be comparable to other near-shore areas of southern California. (Klein)
W76-03644

THE SIGNIFICANCE OF DIISOCYANATE STABILITY IN WATER IN HYGIENIC STANDARDIZATION, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya S.S.S.R. Moscow. Institut Biofiziki.
E. D. Sopach, and L. P. Boltromeyuk.
Gig Sanit, 7, 10-13, 1974.

Descriptors: *Kinetics, Water pollution sources, *Hydrolysis, *Ureas, Water quality standards, Public health.
Identifiers: *Amines, *Cyanates, Diamines, Diisocyanates, Polyureas.

In order to standardize and assess contamination of water bodies with diisocyanates, stability of diisocyanates and of the products of their hydrolysis (Diamines) was studied. The quantitative relationship of diamines and polyureas was studied.--Copyright 1975, Biological Abstracts, Inc.
W76-03648

DANGER OF PESTICIDE POLLUTION OF ARTIFICIALLY REPLENISHED GROUNDWATER RESERVES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii Gigieny, Vilnius (USSR).
D. G. Krasil'shchikov.
Gig Sanit, 8, 90-91, Illus, 1974.

Descriptors: Artificial recharge, *Groundwater recharge, *Pesticide residues, *Herbicides, Percolation, Sands, Detergents, Potable water, *Chlorinated hydrocarbon pesticides, *Path of pollutants.
Identifiers: *Sodium trichloroacetate, Sulfanol.

The degree of penetration of the water-soluble herbicide sodium trichloroacetate during vertical percolation of contamined river wwater through sands was studied. During 15-day percolation the polluted river water was not freed of the herbicide. Addition of the anionic detergent sulfonol to the water had no substantial effect on the degree or depth of penetration of the herbicide. Sodium trichloroacetate present in the initial waters can penetrate into artificially recharged drinking waters.--Copyright 1975, Biological Abstracts, Inc.
W76-03649

HISTORICAL CHANGES IN MERCURY CONTAMINATION IN MICHIGAN WALLEYES (STIZOSTEDION VITREUM VITREUM),
Michigan Univ., Ann Arbor. Great Lakes Resource Management Program.
T. M. Kelly, J. D. Jones, and G. R. Smith.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1745-1754, 1975. 4 fig, 3 tab, 13 ref.

Descriptors: *Freshwater fish, *Mercury, *Metals, Path of pollutants, Water pollution, Water quality, Methodology, Dehydration, Analytical techniques, *Walleye, Michigan, Water pollution effects.
Identifiers: *Michigan walleyes, Historical samples, Bioaccumulation, Tissue analysis.

Mercury concentrations in Michigan walleyes (Stizostedion vitreum vitreum) were more variable among localities than between recent and historical samples within localities. Walleyes in four of seven localities showed no statistical significant increases in the level of mercury contamination over the past 40 years. Methods for validly comparing preserved and fresh specimens were established by tests to determine the weight loss through dehydration in preservation. In 74% alcohol, muscle tissue of medium to large walleyes dehydrated to about 70% of the fresh weight in the first year. Mercury concentration in wallege muscle from recent and old museum collections was positively correlated with age and size. Considerable variation in concentration existed not only between geographic areas, but within populations, and even within subsamples of the same sue. (Klein)
W76-03652

EXPERIMENTAL DESIGN IN SANITA CHEMISTRY OF POLYMERS, (IN RUSSIAN)
Vsesoyuznyi Nauchno-Issledovatelskii Institut gieni i Toksikologii Pestitsidovm Kiev (USSR).
V. O. Sheftel.
Gig Sanit. 8. 84-87. 1974.

Descriptors: *Polymer, *Potable water, *Plas Chemicals, Organic compounds, Water pollu sources, Storage, Water pollution sources, Pu health.

Experimental design and analysis are discu and 2 examples of solving problems concer the sanitary chemistry of polymers are prese showing successful application. The 1st exa was an investigation of polystyrene vessel drinking water storage, where the concentrati styrene in the water was determined and the example was the determination of divinyl libe from linoleum.--Copyright 1975, Biological stracts, Inc.
W76-03709

AGRICULTURAL RUNOFF POLLUTES FACE WATERS, PART I,
South Dakota State Univ., Brookings. De Civil Engineerig.
For primary bibliographic entry see Field 5A.
W76-03719

EFFECTS OF A SANITARY LANDFILL GROUNDWATER QUALITY IN ASHI NEW HAMPSHIRE,
New Hampshire Univ., Durham. Inst. of N and Environmental Resources.
For primary bibliographic entry see Field 5C
W76-03721

DEVELOPMENT OF IRON AND MANGA BACTERIA IN RANNEY WELLS,
F. F. Barbic, M. V. Djindic, D. M. Bracilov M. Djorolijevski, and S. B. Milcic.
Journal of the American Water Works A tion, Vol 67, No 10, p 565-572, October 197 5 tab.

Descriptors: *Iron bacteria, Wells, *Man *Iron, Europe, Clogging, Sedimentation, B
Identifiers: *Ranney Wells, *Ochre, Belgra goslavia, Bacteria identification, Mangane teria.

Results were discussed of an investigation ing bacteriaflora that influence the cre ochre, or iron ore, in the Ranney wells in B Research was conducted on 26 wells lo the right and left shores of the Sava Rive Sava Island of Ada Ciganlija. Glass ar plates were placed in the drains of the Wells to observe bacteria growth, and the of the bacteria to concentrations of fer ferric iron. The exposure period for the p 20 to 30 days during the spring and again d fall. The wells are 22 to 30 meters deep height of standing water in the wells vari to 14 meters. The drains are situated gravel just above the impermeable clay l study found that bivalent iron must be a to bacteria, but not necessarily in the w As the water passes through horizontal d ferrous ion is bound with bacteria so th rous ion is found in the shaft of the w there is a great quantity of iron bact results also indicate that the drain phenomenon of Ranney wells is complex not be explained only by the microorgan ty. In general, ochre sedimentation incr age of the wells. A decrease in yield is on mechanical clogging of the we NWWA)

-03761

: MACRO-INVERTEBRATE FAUNA OF
: INTERTIDAL SOFT SEDIMENTS OF
TH EAST ENGLAND,
tute of Terrestrial Ecology, Norwich
land). Colney Research Station.
. Kay, and R. D. Knights.
nal of the Marine Biological Association of
United Kingdom, Vol 55, p 811-832, 1975. 8
tab, 14 ref.

riptors: *Intertidal areas, *Habitats,
ciation, *Sediments, Population, Silts, Sands,
sels, Invertebrates, Communities, Distribu-
patterns, Ecosystems.
ifiers: Diversity, Hydrobia ulvae, Cardium
.

rvey of the macro-invertebrate fauna of the
idal soft-sediments of southeast England was
d out. The most diverse community found
hat of the mussel bed which was independent
diment type and also showed the most abun-
invertebrate fauna. Second in both abundan-
d diversity was the community in the areas of
d sediments. Areas of fine silt and sand ex-
d less abundant and diverse fauna and were
nated by Hydrobia ulvae. Many of the com-
ies seemed to be related to the particle
ter of the sediment. (Klein)
03764

ONCENTRATION OF 2,2',4,4'-
ACHLOROBIPHENYL IN RAINBOW
UT AS MEASURED BY AN AC-
RATED TEST,
Chemical Co., Midland, Mich. Environmen-
iences Research.
imary bibliographic entry see Field 5C.
03766

TIVE IMPORTANCE OF FOOD AND
ER IN LONG-TERM ZINC-65 ACCUMU-
ON OF MARINE BIOTA,
ational Lab. of Marine Radioactivity, Monte
(Monaco). Oceanographic Museum.
imary bibliographic entry see Field 5C.
3780

ETHYLMERCURY IN RIVER FISH BY
MADE POLLUTION,
Dental Coll. (Japan). Dept. of Hygiene.
anaka, and K. Ueda.
n of Environmental Contamination and
logy, Vol 14, No 4, p 409-414, 1975. 4 fig, 8

ptors: Water quality control, *Mercury,
dology, Water pollution sources, *Public
, Fish, *Industrial wastes, Dredging,
Analytical techniques, Pollutant identifica-
llutants.
iers: *Jinzu River(Japan), *Ethylmercury,
rosal, Dace, Ayu, Plecoglossus altivelis,
on hakonensis.

vels of mercury were found in fish from the
River, in a national surveys of mercury
n river fish throughout Japan. Ethylmercu-
ls were far above the levels of methylmer-
in dace (Tribodon hakonensis) and
coglossus altivelis); this was probably the
e that pollution by this compound was de-
The source was a factory synthesizing an
ic 'Thimerosal', (Sodium ethylmercury
cylate). The highly polluted bottom mud
edged, removing the source of pollution,
mercury level in dace dropped to the con-
el after four years. Characteristic dif-
s between man-made and geologically con-
ed rivers were noted. (Katz)
782

QUANTITATIVE BIOLOGICAL ASSESSMENT OF THE BENTHIC FAUNA IN DEEP BASINS OF THE GULF OF MAINE,

Woods Hole Oceanographic Institution, Mass.
G. T. Rowe, P. T. Polloni, and R. L. Haedrich.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1805-1812, 1975. 1 fig, 3 tab, 34 ref.

Descriptors: *Benthos, *Biomass, Speciation, Population, Communities, Sampling, Sediments, Ecosystems, Distribution patterns.
Identifiers: Diversity, *Gulf of Maine.

The abundance, biomass and diversity of the macro- and mega-fauna in the deep basins of the Gulf of Maine were estimated from 41 quantitative infaunal samples and 17 visual transects. The homogeneous fine silt and clay sediments supported an infaunal abundance and wet preserved biomass which were relatively low for a continental margin with high sediment organic carbon. Diversity estimates from core samples were lower than core sample values from the continental slope, suggesting that the seasonally stable Gulf of Maine basins, because of their short geologic age, do not yet contain an equilibrium assemblage. An additional possibility suggested was that seasonal variations in the production of organic matter, being more pronounced in the Gulf of Maine than offshore in deep water, affect community structure on the bottom. (Klein)
W76-03783

ACCUMULATION AND APPARENT ABSENCE OF DDT METABOLISM BY MARINE COPEPODS, CALANUS SPP. IN CULTURE,

Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5C.
W76-03784

PROBLEM OF MERCURIALISM IN CONNECTION WITH MERCURY POLLUTION OF THE ENVIRONMENT, (IN RUSSIAN),

I. M. Trakhtenberg, and M. N. Korshun.
Gig Sanit. 8: 72-76. 1974.

Descriptors: *Mercury, Heavy metals, Algae, *Industrial wastes, Environment, *Reviews, Aquatic animal, Fish, Water pollution effects, Water pollution sources, *Environmental effects.

Literature on pollution of the biosphere with Hg compounds is reviewed. Effects on algae, mollusks, fish, calves, birds (eagles), experimental animals and humans (including children) are cited. Occupational exposure hazards are discussed. Hg pollution must be maximally decreased by reducing the industrial use of Hg, by banning the uses of Hg-containing fungicides and by effective methods of extracting Hg compounds from emissions and wastewaters.--Copyright 1975, Biological Abstracts, Inc.
W76-03796

DYNAMICS OF NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS,

Tennessee Eastman Co., Kingsport.
R. A. Poduska, and J. F. Andrews.
Journal Water Pollution Control Federation, Vol 47, No 11, p 2599-2619, November, 1975. 18 fig, 5 tab, 26 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Model studies, Mathematical models, *Nitrification, Water pollution sources.
Identifiers: Completely mixed reactors, Plug flow reactors.

A dynamic model was developed for the nitrification in the activated sludge process that relates the time-varying effluent concentrations of ammonium, nitrite, and nitrate nitrogen to the influent nitrogen concentration and flow rate. The model was used to determine design criteria and operation methods to improve the efficiency of nitrification. The model consists of five differential equations based on substrate and organism mass balances. The reactor process modeled was a single-stage, completely mixed aeration basin followed by a solids-liquid separator. Experimental verification of the model was obtained by step and impulse forcings of influent nitrogen concentrations and flow rates for continuous flow, completely mixed nitrifying suspended culture reactors operated at a pH of 7.2, temperature of 23 C, hydraulic retention time of 11 hr, and 10 day old sludge. The steady-state results of the model satisfactorily predict the level of nitrification reported in the literature for full-scale and pilot plant activated sludge plants. Model simulations have shown: the degree of nitrification in an activated sludge process depends on the sludge age; a plug flow reactor system will produce an effluent with a lower ammonium concentration than a completely mixed reactor for sludges younger than 5 days; the efficiency of nitrification is lower for dynamic operation than for steady-state operation when the sludge age is less than 5 days; and, a plug flow reactor is more resistant to toxic pulses with respect to maintaining nitrification than a completely mixed reactor. (Orr-FIRL)
W76-03797

REVIEW OF THE MODELS OF TIDAL WATERS,

Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
J. B. Hinwood, and I. G. Wallis.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 101, No HY11, p 1405-1421, November, 1975. 1 ref, 1 append.

Descriptors: *Mathematical models, *Tidal waters, Water quality control, Water quality, Hydrodynamics, Estuaries, Waste water(Pollution).
Identifiers: *Tidal water modeling, Kinematic modeling, Estuarine modeling, Transport modeling, Waste movement models.

A classification scheme for water and waste movement models previously had been defined based on the number of spatial dimensions and reference frames. Eulerian, Lagrangian and constant upstream volume frames of reference were used. Hydrodynamic, kinematic and transport models were examined for each classification. A review of these models is undertaken. Zero-dimensional models were defined to estimate the seriousness of a waste discharge problem. They can only be transport models. One-dimensional Eulerian models give accurate descriptions of waste concentration and movement in long estuaries. One-dimensional hydrodynamic models predict tidal elevations reasonably well. One-dimensional transport models predict longitudinal waste concentration. For one-dimensional non-Eulerian models, the frame of reference moves up and down the estuary with the tide, keeping a constant volume of water above it. Only transport models have been developed for this frame of reference. These models simulate water movement more closely than do Eulerian models. Two dimensional plan view models represent the longitudinal and lateral movement of wastes. Hydrodynamic models in this class can either include nonlinear acceleration or not. Tide heights were predicted very accurately with this model. These models work best for irregular estuaries with coriolis and wind circulations. Two dimensional side elevation models are limited to narrow estuaries that are well mixed laterally. Three dimensional models allow the complete spatial distribution of the waste field to be predicted. This type of modeling can be expected to develop rapidly in the next few years. (Pinto-FIRL)
W76-03798

MULTI-PROCESS BIOLOGICAL TREATMENT MODEL,
CH2M Hill, Bellevue, Wash.
For primary bibliographic entry see Field 5D.
W76-03799

A MATHEMATICAL MODEL FOR PHOSPHORUS MOVEMENT IN SOILS,
Michigan State Univ., East Lansing. Dept. of Chemical Engineering.
D. B. Shah, G. A. Coulman, L. T. Novak, and B. G. Ellis.
Journal of Environmental Quality, Vol 4, No 1, p 87-92, January/March, 1975. 3 fig, 16 ref.

Descriptors: *Path of pollutants, *Waste water treatment, *Waste disposal, *Groundwater movement, *Phosphorus, *Mathematical models, Model studies, Water pollution sources, Irrigation, Equations, Simulation analysis, Soil mechanics.
Identifiers: Land application.

Because land treatment of municipal and industrial effluents is increasing as a disposal method, an understanding of the movement of phosphorus in the soil is needed. A model was developed to describe the quantitative behavior of water and phosphorus. It was shown that the water saturation profile travels faster than the phosphorus profile. The water distribution between irrigation in the Barriered Landscape Water Renovation System, constructed by Michigan University, had a negligible effect on phosphorus movement. The model formulated included material balance equations for water in the soil pore spaces, phosphorus in the liquid phase, and adsorbed phosphorus on the soil. Equations were solved numerically to simulate the phosphorus concentration profiles in the soil solution and in the soil as functions of depth for an operating waste disposal system. This type of model with predictive capacity is useful for the design of waste water irrigation sites which must be designed to minimize phosphorus leakage to the groundwater. (Kramer-FIRL)
W76-03802

NITRATES IN WISCONSIN GROUND WATER,
Wisconsin State Lab. of Hygiene, Madison.
B. Schuknecht, G. W. Lawton, P. Steinke, and J. J. Delfino.
Environmental Letters, Vol 9, No 1, p 91-98, 1975. 15 ref.

Descriptors: *Nitrates, *Groundwater, *Wisconsin, Wells, Chemical analysis, *Pollutant identification, Sewage, Potable water, Bacteria, Nitrites, Public health.
Identifiers: Methemoglobinemia, Columbia county(Wisc), Dane county(Wisc), Phenoldisulfonic acid method, Automated diazotization technique.

Nitrates in groundwater are sometimes found in unacceptably high levels. In earlier studies they were found to be reduced by bacteria in infants' digestive tracts to nitrites and cause methemoglobinemia. Nitrate analyses were performed on groundwater well samples originating from sources throughout Wisconsin. Wells of varying types, age and quality of construction were included in the test. The phenoldisulfonic acid method and an automated diazotization technique were used to determine the nitrate concentrations. Both techniques yielded comparable data. Results of the testing program showed that 38% and 39% of all wells in Columbia and Dane counties, respectively, had nitrate levels above the drinking water standard of 10 mg N03-N/liter. Most of the deeper wells had lower nitrate levels than shallow wells. In Columbia county nitrate levels were influenced by the relative proximity of the well to barnyards, sewage seepage areas, animal feedlots and liquid manure storage facilities. About 9% of samples selected randomly across the state had nitrate levels above 10 mg N03-N/liter, and six counties had 20% of the wells over the standard. Newer wells had considerably lower nitrate levels than older wells, mainly due to the greater depth of the newer wells, and improved drilling and construction standards. (Pinto-FIRL)
W76-03803

CHANGES OF THE GROUNDWATER SUPPLY CONDITIONS IN CONNECTION WITH CONSTRUCTION OF RESERVOIRS (BASED ON EXPERIENCE OF THE GORKI RESERVOIR, (IN RUSSIAN),
Gorkovskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5C.
W76-03804

NITRATE NITROGEN DISTRIBUTION IN CORN LAND FOLLOWING APPLICATIONS OF DIGESTED SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
N. E. Stewart, E. G. Beauchamp, C. T. Corke, and L. R. Webber.
Canadian Journal of Soil Science, Vol 55, No 3, p 287-294, August, 1975. 1 fig, 5 tab, 15 ref.

Descriptors: *Sludge disposal, *Sludge, *Fertilization, *Nitrogen, Nitrates, Ammonia, Anaerobic digestion, Environmental effects, Agriculture.
Identifiers: *Nitrate nitrogen.

A study was conducted on the nitrogen distribution in crops and soil following applications of anaerobically digested sewage sludge. The following topics were discussed: some of the physical and chemical characteristics of digested sewage sludge; the influence of several sewage sludge application rates on nitrate accumulation and subsequent movement through the crop-rooting zone during a growing season; the evaluation of a crop as a method of soil nitrogen removal; and, an assessment of the nitrogen fertilizer value of digested sewage sludge with respect to crop yield. The digested sludge was applied to Harriston loam soil at rates of 0.0, 1.25, 2.5, and 5.0 cm/ha; corn was then grown on the plots. Nitrification of nitrate-nitrogen in the sludge occurred 6 days after application only in the top 20 cm of soil. The yields of corn grain and stover were significantly increased by sludge application rates greater than 1.25 cm/ha. The total-N concentration in the grain increased slightly at application rates above 1.25 cm/ha. About 3 to 12% of the total-N applied as sludge was removed by the corn. About 30% of the applied ammonium was lost one week after application due to volatilization. An annual sludge application on a Harriston loam on which corn is grown should not exceed 1.25 cm/ha. (Orr-FIRL)
W76-03814

GEOCHEMICAL FACTORS AFFECTING ARTIFICIAL GROUNDWATER RECHARGE IN THE UNSATURATED ZONE,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 5G.
W76-03818

FATE OF WASTEWATER SLUDGE IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5E.
W76-03825

ASSESSING PHYSICAL POTENTIAL FOR DEEP DISPOSAL OF INDUSTRIAL WASTES BY WELLS IN THE SOUTHEASTERN UNITED STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
For primary bibliographic entry see Field 5E.
W76-03840

THE EFFECT OF INCINERATION ... METALS, PESTICIDES, ... POLYCHLORINATED BIPHENYLS ... SEWAGE SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Lab.
For primary bibliographic entry see Field 5D.
W76-03845

DETERMINING ULTIMATE CAPACITY ... THE COASTAL ZONE FOR WASTEWA... AND WASTEWATER RESIDUALS,
Rosenstiel School of Marine and Atmosph... Science, Miami, Fla.
For primary bibliographic entry see Field 5E.
W76-03847

THE EFFECT OF SANITARY LANDFILLS ... WATER QUALITY IN SOUTHERN INDIAN...
Indiana Univ., Bloomington. Dept. of Geograp...
D. B. Waldrip.
Available from the National Technical Info... tion Service, Springfield, Va 22161 as PB-249... $6.75 in paper copy, $2.25 in microfiche. PhD ... sis, April 1975. 160 p, 28 fig, 25 tab, 88 ref, ... pend. OWRT B-049-IND(2). 14-31-001-3584.

Descriptors: *Landfills, *Solid wastes, *... pollution, *Water pollution effects, *Leac... *Indiana, Soil chemistry, Path of pollut... Groundwater movement, Cation exchange, ... quality, Surface waters, Soil properties, Per... bility, Groundwater.
Identifiers: *Monroe County landfill(Ind), *B... County landfill(Ind), *Columbus Municipal ... fill(Ind).

A major environmental issue associated with ... tary landfills is the possiblity that decompo... of buried solid waste may cause deteriorati... water quality. This research was undertak... evaluate the degree of water quality chang... may be expected by operating a sanitary lan... southern Indiana. Three landfill sites ... selected for study. The Monroe County ... Brown County landfills are in dissected ... with a surface cover of loess and/or alluvium ... lying Borden siltstone, while the Columbus ... is located in the White River floodplain. A d... geologic and hydrologic investigation wa... ducted at each site to evaluate any water ... changes caused by landfilling. Surface water ... tion was present at the Monroe and Brown ... landfills. Diluted leachate was observed 70... downstream from the Monroe County ... while at the Brown County site all contam... was confined within the perimeter. At the ... bus landfill, severe groundwater contam... was observed but became diluted and dis... within 100 feet of the landfill boundary. ... ISWS)
W76-03851

SEMI-INFINITE SOLID MODEL FOR PR... TION OF TEMPERATURE IN DEEP ... VOIRS AND LAKES,
Arkansas Univ., Fayetteville. Dept. of C... Engineering.
For primary bibliographic entry see Field 2...
W76-03852

APPENDIX 7, WATER QUALITY, ... LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann... Michigan, Public Information Office.
For primary bibliographic entry see Field 5...
W76-03864

AN EVALUATION OF THE ACCUMUL... TRANSLOCATION, AND DEGRADAT... PESTICIDES AT LAND WASTE ... DISPOSAL SITES,
California Univ., Berkeley. Sanitary En... Research Lab.

. Klein, D. Jenkins, R. J. Wagenet, J. W.
ar, and M. S. Yang.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as AD/A-006 Price $8.00 in paper copy, $2.25 in microfiche. L Report No. 74-4, November 1974. 235 p, 27 8 tab, 43 ref, 5 append. DADA-17-73-C-3109.

riptors: *Pesticides, *Insecticides, *Soil sal fields, *Evaluation, *Water pollution ces, *Path of pollutants, Soil analysis, Water ysis, Degradation(Decomposition), Waste sal, Water pollution, Organophosphorus pounds, Poisons, Diazinon, Decomposing or- c matter, Organic wastes, Oxidation, Soil sur- s, Irrigation, Waste water disposal, Or- phosphorus pesticides, Lysimeters, Waste r(Pollution), Soil types.
ifiers: *Organophosphates, *Biocide accu- tion, *Biocide degradation, *Biocide translo- n, Malathion, Carbaryl, 2,4-D butoxyethyl , Spray irrigation.

purpose of the investigation was to determine ate of Malathion, Carbaryl, Diazinon, and 2,4- toxyethyl ester during sewage spray irrigation nd disposal sites. Biocide accumulation and dation in soil and translocation in soil and r was assessed. Sheltered soil lysimeters were irrigated thrice weekly at a loading rate of 2 r week with wastewaters containing 0.1 mg/l ch biocide. Five soils ranging in type from textured to coarsely textured were ex- ed and two of these soils were also studied in plots. Initially lysimeters and field plots were ized by irrigating with secondary effluent ining biocides. A series of changes consisting tionic slugs (Mg and Na), increased organic ng, and simulated rainfall (biocide-free) were sed. Lysimeter results indicated Diazinon ac- lation of a low level in upper soil regions and evels of Diazinon and Malathion only at soil ces. Carbaryl was never observed in soils or aters and no significant accumulation of the biocides was detected. Field plot results nstrated that gross movement of Diazinon Malaoxon could occur under unusual condi- only. Their movement was attributed to dry- nd cracking of soil, followed by heavy rain- Another contributing factor was periodic val of vegetation which removed a barrier ppeared to intercept the biocides. Inormation neral pickup was gathered from both lysime- nd field plots. The mineral quality of the ef- appeared to be influenced more by soil type character of applied wastewater. (Henley-
)
03871

TIONSHIPS BETWEEN PRECIPITATION, AM WATER CHEMISTRY, AND TATION FOR THE BOWL, A FORESTED ERSHED IN NEW HAMPSHIRE,
Hampshire Univ., Durham. Inst. of Natural nvironmental Resources.
imary bibliographic entry see Field 4D.
03875

RRENCE OF CHLORINATED OCARBON INSECTICIDE, SOUTHERN IDA--1968-72,
gical Survey, Miami, Fla.
Mattraw, Jr.
des Monitoring Journal, Vol 9, No 2, p 106- eptember 1975. 7 fig, 2 tab, 12 ref.

ptors: *Pesticide residues, *Water pollution s, *Insecticides, *Chlorinated hydrocarbon des, Surface waters, *Florida, DDT, DDD, Agricultural runoff, Path of pollutants, ng, Chemical analyses, Canals, Sediments, logic system.
iers: Southern Florida, *Everglades(Fla).

equency with which chlorinated hydrocar- secticides appear in samples of southern Florida surface waters decreased sharply between 1968 and 1972. Sediment analyses attest to the earlier widespread use of chlordance, DDT, and dieldrin. Insecticide residues are more frequently detected in southern Florida than in other U.S. cropland soils. Transport of DDT, DDD, and DDE from the Everglades agricultural area into water conservation areas and undeveloped parts of the Everglades of southwestern Florida is facilitated by a system of water-management canals. Canal sediments within the urban area of souther Florida have high DDD, DDE, and dieldrin residue concentrations which may reflect local use of insecticides rather than their transport from adjacent agricultural areas. (Woodard-USGS)
W76-03898

STREAM QUALITY IN RELATION TO MINE DRAINAGE IN COLORADO,
Geological Survey, Denver, Colo.
D. A. Wentz.
In: Water Resources Problems Related to Mining: American Water Resources Association Proceedings Series No 18, p 158-173, June 1974. 5 fig, 5 tab, 31 ref.

Descriptors: *Water pollution sources, *Mine drainage, *Surface waters, *Streams, *Colorado, Water quality, Chemical analysis, Trace elements, Coal mines, Acidic water, Data collections, Path of pollutants.
Identifiers: *Metal mining(Colo).

Most of Colorado's metal deposits are composed of sulfide ores. Oxidation of associated pyrite yields acidic water, which in turn dissolves other metal sulfides and releases trace elements to the surface drainage. The process is relatively unimportant in coal deposits within the State. Trace elements in Colorado streams do not often follow a normal or simple lognormal frequency distribution. Concentrations of cadmium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, vanadium, and zinc occur in greater concentrations in streams draining metal-mining areas than in streams draining coal-mining or control areas. Of these, cadmium, cobalt, copper, manganese, nickel, and zinc tend to occur together. Arsenic, chromium, mercury, selenium, and silver do not seem to occur at anomalously high levels in metal- or coal-mining areas. Based on this study, it is suggested that field measurements of specific conductance and pH can be used as a guide in the selection of streams affected by metal mining. Visual observations of stream conditions can also help. In situations where visual observations are difficult (for example, groundwater studies), measurement of one or more indicator chemical constituents may be feasible. In Colorado, zinc, and possibly sulfate, might be used in this regard. (Woodard-USGS)
W76-03900

THERMODYNAMIC CONSTRAINTS ON METAL SOLUBILITIES IN A STREAM AFFECTED BY MINE DRAINAGE, BONANZA, COLORADO,
Geological Survey, Denver, Colo.
R. E. Moran, and D. A. Wentz.
In: Water Resources Problems Related to Mining: American Water Resources Association Proceedings Series No 18, p 54-64, June 1974. 8 fig, 1 tab, 15 ref.

Descriptors: *Water pollution sources, *Mine drainage, Streams, *Colorado, *Metals, Solubility, Water chemistry, Trace elements, Chemical precipitation, Chemical analysis, Thermodynamic behavior, Cadmium, Copper, Iron, Lead, Manganese, Nickel, Zinc.
Identifiers: *Bonanza(Colo).

Drainage from abandoned metal mines and tailings piles has resulted in acid, metal-liferous surface water in the vicinity of Bonanza, Colo. Much of the streambed is coated with amorphous Fe(OH)3 that contains significant concentrations of other metals. Using thermodynamic techniques, it was found that several compounds other than Fe(OH)3 could be precipitating. These compounds include Cu2(OH)2CO3, Cu3(OH)2(CO3)2, Cu3(OH)4SO4, Cu4(OH)6SO4.H2O, MnCO3, and Zn2SiO4. Solubility products were not exceeded for any of the cadmium, lead, or nickel compounds considered. (Woodward-USGS)
W76-03901

FINITE ELEMENT SOLUTIONS TO TWO GROUNDWATER FLOW PROBLEMS - ONE INCLUDING DISPERSION AND THE OTHER THE INFLUENCE OF ELECTRO-OSMOSIS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
T. S. Nishi, J. C. Bruch, Jr., and R. W. Lewis.
Available from NTIS, Springfield, Va 22161 as PB-249 181, $4.50 in paper copy, $2.25 in microfiche. College of Engineering, UCSB-ME-75-3, August 1975. 58 p, 6 fig, 35 ref, 6 append. (California Water Resources Center Project UCAL-WRC-W-428).

Descriptors: *Finite element analysis, Groundwater, *Base flow, *Dispersion, *Electro-osmosis, Groundwater movement, *Path of pollutants, Seepage, Recharge wells.
Identifiers: Convection dispersion.

Man's concern with the destruction of his environment has promoted an interest in the knowledge of the movement of pollutants in groundwater aquifers. This study concerns itself with two problems in this area: (1) hydrodynamic dispersion in seepage from a triangular channel, and (2) the influence of electro-osmosis on flow in an aquifer with a recharge and discharge well. The finite element method using rectangular elements is employed to solve two-dimensional isotropic, homogeneous hydrodynamic flow and dispersion in the first problem and the effect of electro-osmosis on the hydrodynamic flow field in the second problem. Also, included are comparisons between finite element, finite difference and analytical solutions of a test dispersion-convection problem. The finite element results compare favorably with the analytical solution and do not exhibit the numerical dispersion problems that arise in the finite difference solution. (Snyder-Calif, Davis)
W76-03962

POLLUTANT MOVEMENT BENEATH RIVERS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 453, $4.00 in paper copy, $2.25 in microfiche. Technical Completion Report, July 1975. 23 p, 12 ref. (California Water Resources Center Project UCAL-WRC-W-428).

Descriptors: *Pollutants, Water pollution control, *Groundwater movement, Convection, *Dispersion, *Path of pollutants, *Seepage, Open channels, Rivers, *Finite element analysis.
Identifiers: *Convection-dispersion equation.

The work completed in this project deals with the movement of pollutants beneath open channels. This movement is considered to be caused by the dispersion and convection effects. The phenomenon of the reaction of the waste constituents with the porous media and the decay of the constituents with time were not dealt with, but could easily be included in the general algorithm. There are two distinct, yet coupled parts, to the convective-dispersion problem. The equation of motion for the resident fluid provides the necessary information concerning the seepage flowfield, while the convective-dispersion equation describes the behavior of the pollutant. Each of these will be described separately and then combined for the total problem. Examples and com-

parisons are given with other published data. (Snyder-Calif, Davis)
W76-03963

SURFACE RUNOFF IN DAIRIES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
A. C. Chang, D. Aref, and D. C. Baier.
California Agriculture, Vol 29, No 4, p 16-17, April, 1975. 2 fig, 2 ref.

Descriptors: *Farm wastes, *Agricultural runoff, *Dairy industry, *Water pollution, *California, Hydrology, Suspended solids.

Surface runoff usually carries a high water pollution potential if it comes from livestock-manured areas. In an area such as the Chino-Corona dairy preserve, which has a heavy concentration of livestock, manure-laden runoff could be a significant portion of the total surface runoff of the watershed and could degrade the quality of the receiving stream. The purpose of this study was to attempt to determine the hydrologic and water quality characteristics of surface runoff from this area. Researchers simulated precipitation on the surface of dairy corrals where animals are confined, rather than wait for runoff-generating storms. A table is provided which summarizes the hydrologic characteristics of each delivered precipitation and its resultant runoff. The transport of suspended solids by overload flow did not appear to be a serious problem on mildly-sloped land, although the loss of dissolved minerals to surface runoff was significant. Channels have a tendency to be formed by overland flow traveling a long distance; this channelled flow with higher velocity would transport larger amounts of loosely-packed wastes. No channel was formed under experimental conditions. This information leads to the conclusion that a well-sloped corral surface would minimize the loss of suspended material through runoff. (Penrod-East Central)
W76-03970

POLLUTANT MOVEMENT TO GROUND WATER FROM SWINE WASTE LAGOONS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
T. G. Ciravolo, K. L. Hallock, H. R. Thomas, E. R. Collins, Jr., and D. C. Martens.
1973-74 Livestock Research Report, Research Division Report 158, Virginia Polytechnic Institute and State University, Blacksburg, July, 1974, p 5-10. 4 tab.

Descriptors: *Farm wastes, *Groundwater, *Lagoons, *Anaerobic conditions, *Coliforms, *Nutrients, Hogs, Water pollution.

Flushing swine wastes into an anaerobic lagoon is a relatively inexpensive waste disposal method. Information from a literature search indicates that there may be seepage from such a lagoon. The purpose of this study is to monitor the effect of seepage from anaerobic swine lagoons on ground water quality. The two lagoons studied are located in high water table soils in the Coastal Plain Region of Virginia at the Tidewater Research and Continuing Education Center and at the Virginia Swine Evaluation Station. The wells, consisting of 2 inch PVC pipe, were water jetted at distances of 10, 50 and 100 ft. from the two anaerobic swine lagoons to depths of 10, 15, and 20 ft. At the 20 ft. depth that was 50 ft. from the lagoon at the Swine Evaluation Station in August and at the 10 ft. depth located 50 ft. from the lagoon in November, the 0.1 ppm Cu recommended limit was exceeded. Chemical-oxygen-demand, coliform bacteria, and concentration of Cl-, NO3-, NH4+, soluble phosphate, Mg++, K+, Na+, Cu++, Zn++, and Mn++ were the constituents being determined in ground water samples. Preliminary analyses summary shows that U.S. Public Health Department drinking water standards were not exceeded for Cl-, Cu++, NO3- and Zn++. Fluctuations in the chemical constituents concentrations indicated that ground water contamination occurred only at 10 ft. distances. A study is continuing with chemical oxygen demand and fecal coliform bacteria being determined. (Penrod-East Central)
W76-03973

A SURVEY OF EFFECTS OF ANIMAL WASTES ON STREAM POLLUTION FROM SELECTED DAIRY FARMS,
Clemson Univ., S.C. Dept. of Dairy Science.
J. J. Janzen, A. B. Bodine, and L. J. Luszcz.
Journal of Dairy Science, Vol 57, No 2, p 260-263, February, 1974. 3 tab, 5 ref.

Descriptors: *Farm wastes, *Water pollution, *Dairy industry, Sampling, *Coliforms, *South Carolina, *Biochemical oxygen demand, *Chemical oxygen demand, Nutrients, Hydrogen ion concentration.

A study was conducted in South Carolina in which water was sampled from streams adjacent to selected dairy farms. The waste management systems utilized by these farms were lagooning, dry disposal, and liquid manure handling. Stream samplings were taken above, adjacent to, and below the major animal waste drainage areas. It was determined that 42 percent of the selected farms contributed in varying amounts to a reduction in stream water quality. Twenty-six percent of these farms contributed to significant increases in fecal coliform concentrations. Studies are underway to determine the effects of depth, site, and frequency of sampling on measures of stream water quality. Water quality data is also being collected for streams draining virgin lands that are free of domesticated animals. (Penrod-East Central)
W76-03974

REVIEW PAPER: ANIMAL WASTES MANAGEMENT AND CHARACTERIZATION,
Utah State Univ., Logan. Div. of Environmental Engineering.
J. E. Middlebrooks.
Water Research, Vol 8, p 697-712, 1974. 1 fig, 13 tab, 46 ref.

Descriptors: *Farm wastes, Physical properties, Chemical properties, *Agricultural runoff, *Waste treatment, *Nutrients, *Feed lots, *Confinement pens, Locating, Lagoons.
Identifiers: *Waste management, Land disposal, Retention ponds.

Agricultural-related environmental quality problems have received little attention until the last 10 years. The purpose of this report is to attempt to provide an overall picture of the characteristics and treatability of animal wastes and runoff from animal feedlots. The study showed that there is a wide variability in both the characteristics and performance of treatment facilities. Loehr (1972) proposed several feedlot runoff control measures, such as retention ponds, use of evaporation ponds, diversion, land disposal of the excess liquid and accumulated solid matter, confinement, and proper location. All of the above methods can easily be adapted to fit a particular situation under certain environmental conditions. Application of one or all of these methods depends on such factors as rainfall patterns for a particular area, rainfall amount and frequency, and geography. Location selection is possibly a key in the control of feedlot and animal waste pollution. Another significant factor in controlling feedlot and animal waste pollution is the number of waste management alternatives that are made available to a feedlot operator. However, it appears that the agricultural industry is incapable of absorbing the costs of conventional waste treatment at this time. Therefore, whenever possible, feedlot location should be such that the old reliable method of confinement and land disposal can be employed. (Penrod-East Central)
W76-03978

SOIL WATER NITRATE BENEATH A BROA
BASIN TERRACED FEEDLOT,
Nebraska Univ., Lincoln. Agricultural Experim
Station.
L. F. Elliott, T. M. McCalla, N. P. Swanson, L.
Mielke, and T. A. Travis.
Transactions of the ASAE, Vol. 16, No. 2, p.
286, 293, March-April, 1973. 10 ref.

Descriptors: *Farm wastes, *Soil wa
*Nitrates, *Feed lots, Agricultural run
Nebraska, Denitrification.
Identifiers: *Broad-basin terraced feedlot.

Nitrate accumulations occur beneath s
feedlots but not others. Some recent studie
dicate the possible role of management in ni
accumulation beneath feedlots. More recen
ports indicate continuous stocking of feedlots
preclude nitrate accumulations beneath u
Further investigation is warranted as runoff-
trol systems may complicate the situation. S
son (1973) described a broad-basin terrace sy
that meets Nebraska runoff-regulatory req
ments. The objective of this study was to d
mine if excessive nitrate accumulations in
feedlot soil profile would be caused by
system. Initiated in an 8-month-old, broad-
terraced feedlot, caisson studies showed tha
water nitrate values rose initially. When the
was terminated, after 13 months, N03 -N at
and 5 ft, was 1.4, 10, and 12.5 ppm, respecti
Oxygen decreased and C02 increased durin
latter part of the test period, indicating red
conditions were occurring. The establishme
reducing conditions and the decrease in nitra
indications of denitrification. Test result
dicated that nitrate did not percolate below
(Penrod-East Central)
W76-03981

DETERMINING APPLICATION RATES
LIVESTOCK WASTES TO THE LAND,
Illinois Univ. at Urbana-Champaign. Soil Fe
Extension.
S. R. Aldrich.
Presented at Proceedings of 1973 Livestock
Management Conference, Champaign, Il
March 7-8, 1973, p J1-J12. 1 fig, 1 tab, 26 ref.

Descriptors: *Farm wastes, *Livestock, *Po
Nitrates, Water pollution, Groundwater pol
Phosphorus, Salts, Ammonia, Denitrifi
Agricultural runoff, Application rates.
Identifiers: *Land disposal.

Much trial and error has occurred in try
determine the application rates of livestock
to the land. The objective of this report is
amine the disposal on agricultural land of co
animal wastes. The study showed that the
program for manure disposal consists of 10-
of large-animal waste or 5-10 tons of poultry
per acre per year applied for the purpose
cient utilization by responsive crops. In
mediate future, the permissable manure loa
agricultural land will be determined by the
of nitrogen. Between 150 and 250 pounds
amount of nitrogen that can be introduced
soil annually without substantial buildup
Poorly drained, fine-textured soils are su
maximize denitrification and will tolerate
rates than well-drained, coarse-textured so
permissable rate of manure may be increas
receiving water is low in nitrate and is
volume relative to the water from the
area. Where the water is discharged to a
reservoir directly or via a stream, the am
phosphorus in drainage water may be the
factor in waste application. Ammonia co
tion or salt concentration or both may
amount of manure that can be applied at
without injuring germination and plant gro
sloping land where runoff into surface w
likely with normal rainfall, large surface
tions are not acceptable. Future designing
livestock operations must include prop
disposal in the planning. (Penrod-East Cen

6-03985

RONOMIC CONSIDERATIONS OF ANIMAL STE DISPOSAL,
a State Univ., Ames. Cooperative Extension ice.
). Voss.
sented at Midwest Livestock Waste Manage- t Conference, Iowa State University, Ames, ember 27-28, 1973, 7 p, 5 ref.

criptors: *Farm wastes, *Waste disposal, nomy, *Crop response, *Nitrogen, sphorus, Nutrients, Salts.
tifiers: *Land disposal.

is paper the assumption is made that the soil's ulness for crop production is to be maintained. primary concern is if land disposal of animal es is the ultimate goal, how much can be ap- without causing short or long term problems. t term effects would include: salt and toxic ef- on germination and growth of plants, loss of te in drainage water, crop quality, crop yields, surface runoff. Long term effects would in- : crop productivity, accumulative salt effect rops, dispersal of soils by accumulation of m, and nutrient imbalance due to phosphorus ther element buildup. Suggested optimum of application of animal wastes for efficient ation of the nutrients by harvested crops are 20 tons per acre on a fresh weight basis ac- ng to several authorities. Plans for any animal handling system should include provision aste disposal. The plans should be according uidelines which, hopefully, will include omic considerations. (Penrod-East Central) 03987

ROLOGY OF OPEN FEEDLOTS IN THE NBELT,
ska Univ., Lincoln. Agricultural Experiment n.
Swanson.
nted at Midwest Livestock Waste Manage- Conference, Iowa State University, Ames, mber 27-28, 1973, 11 p, 1 fig, 21 ref.

iptors: *Farm wastes, Hydrology, *Feed Rainfall, Snow, Evaporation, Agricultural ru- Snowmelt, Groundwater, Water pollution. iers: Solids losses.

urpose of this study is to examine the ogic factors of open feedlots in the corn The factors discussed are: temperature, evaporation and rainfall. Since the ogic impact of feedlots is on the immediate hed, hydrology should be considered in design and management. Rapid drainage of ot is very desirable and is improved by the ion of mounds and drainways, terraces and and inlet risers with underground drains. control facilities should be desinged for s of probable high-intensity and maximum ly precipitation without opportunity for ru- sposal. The study showed that underground pollution from livestock feeding installa- ppears to be mostly a local problem with read contamination of aquifers not appear- bable. Runoff will be greater and start so- om a feedlot than from adjacent cropland. an be appreciable water storage in the soil- mixture. The study also indicated that elt runoff may contain 10 to 12 times the al oxygen demand and solids content of a runoff from the same lots. It was noted ilar runoff facility design capacities can be d in the Corn Belt states, except in western , Nebraska, and South Dakota. (Penrod- ntral) 990

NDWATER CONTAMINATION CAUSED ASTE WATERS GENERATED IN GAL-

VANIZING PLANTS (GALVANUZEMI SZENNYVIZ ALTAL OKOZOTT TALAJVIZSZENNYEZESEK),
C. Mihaly.
Hidrologiai Kozlony, Vol 54, No 2, p 62-64, February, 1974. 2 fig, 7 ref.

Descriptors: *Waste water treatment, *Groundwater, *Heavy metals, *Metals, Waste discharge, Water pollution control, Waste water(Pollution), Cyanides, Industrial wastes, Wells, Europe.
Identifiers: *Electroplating industry, Chromates, Groundwater contamination, Hungary, Percolation.

Instances of groundwater contamination by electroplating shop-generated effluents in Hungary are presented. Wells nearby percolation grounds used for the discharge of such effluents containing cyanides, chromates, and other heavy metals were contaminated for over six years. Water samples taken from such wells contained chromates well above the maximum allowable level. Even small-capacity electroplating plants discharging less than one cu m treated waste water daily were found to possibly cause serious groundwater contamination. Two cases of eczema due to chromate-contaminated wellwater occurred. None of the contaminated groundwater samples contained trivalent metals due to their rapid adsorption in the ground. Good adsorption of bivalent metals such as copper and zinc in loamy loess was observed. Low rates of adsorption of free cyanide, and the practical absence of adsorption of chromates were found. Treated effluents containing heavy metals should not be discharged in a 1.5 km radius around inhabited areas and areas being or to be used for water supply. (Takacs-FIRL)
W76-03996

STUDIES ON SUBSURFACE MOVEMENT OF EFFLUENT FROM PRIVATE SEWATE DISPOSAL SYSTEMS USING RADIOACTIVE AND DYE TRACERS, PART 2, 1973-74,
Ontario Ministry of the Environment, Toronto.
M. Brandes.
1975. 54 p, 7 fig, 3 tab, 17 ref, 4 append.

Descriptors: Waste water treatment, *Waste water disposal, *Tile drains, *Septic tanks, *Tracers, Phosphorus, *Path of pollutants, Soils, Water pollution sources, Tracking techniques, Radioactive techniques.
Identifiers: *Radioactive tracers.

Radioactive and dye tracers, Tritium, 32P, and Fluorescein, were used to study the underground movement of septic tank effluents from 4 individual sewage disposal systems towards the receiving bodies of water, Lake Couchiching and Little Lake, both in Canada. Tritium was an excellent tracer, however, radioactive phosphorus and fluorescein are not recommended as tracers in soil. The sewage disposal systems consisted of septic tanks and tile fields. The three sites on Lake Couchiching were built on clayey-silt soil. The site on Little Lake was built on imported sand. The tile fields produced a relatively high removal of phosphorus, 78% in sand fields and 90% in clayey-silt fileds. The sewage disposal systems had no effect on the concentration of nitrates in groundwater. The concentration of free ammonia in groundwater from bore holes drilled in clayey-silt soil was lower than from holes in sand. Some part of the ammonia is retained by the finer grain size soil. All of the sewage disposal systems satisfactorily removed coliform organisms. Flooding of the tile fields had no harmful effect on the concentration of pollutants in groundwater. (Orr-FIRL)
W76-04000

5C. Effects Of Pollution

EXPERIMENTAL RESEARCH DATA ON HYGIENIC EVALUATION OF THE METHOD OF MAGNETIC TREATMENT OF WATER, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
N. V. Klimkina, Y. V. Novikov, M. M. Saifutdinov, G. V. Tsyplakova, and A. N. Sergeev.
Gig Sanit. 12. 15-19, Illus. 1974.

Descriptors: *Water treatment, Magnetic studies, *Cytological studies, Water pollution effects, Potable water, Rodents, Public health.
Identifiers: Blood cells, *Magnetic treatment(Water), Central nervous systems(Rats).

The effects of water treated by a magnetic field (intensity of 1300, 2000 and 5000 E (oersted)) on albino rats drinking it for a long period of time were studied. The water treated by 5000 E magnetic field caused changes in the CNS, the red and white blood cells and internal organ cell morphology.--Copyright 1975, Biological Abstracts, Inc.
W76-03536

EUTROPHICATION IN THE HELSINKI AND ESPOO SEA AREAS MEASURED AS PHYTOPLANKTON PRIMARY PRODUCTION,
Helsinki Univ. (Finland). Dept. of Limnology.
P. O. Lehmusluoto, and L. Pesonen.
Oikos, Supplement 15, p 202-208, 1973. 5 fig, 3 tab, 4 ref.

Descriptors: *Eutrophication, *Bays, *Gulfs, *Primary productivity, *Water pollution sources, Outfall sewers, Dominant organisms, Waste dilution, Phosphorus, Nitrogen, Cyanophyta, Diatoms, Europe, Nutrients.
Identifiers: *Gulf of Finland, Helsinki(Finland), Espoo(Finland).

To determine the effects of domestic sewage in the Gulf of Finland near Helsinki and Espoo, phytoplankton primary production was determined during 1966-1970. Primary production exceeded 1.0 g C/sq m/day in the inner bays. At the outermost stations it was usually less than 0.3 g C/sq m/day. Annual phytoplankton primary production varied in the inner bays from 68.6 to 192.5 and in outer stations from 15.0 to 39.0 g C/sq m/yr (the latter values were considered normal for unpolluted parts of the Gulf of Finland). Phytoplankton primary production was 5 to 10 times higher in polluted inner bays than in the open sea. Slight eutrophication was observed when total phosphorus exceed 40 mg P/cu m. In strong eutrophic zones, total phosphorus concentration was over 200 mg P/cu m. The mean ratio of soluble N:P compounds during the growth period in strong eutrophic zones was very low (about 3). In very euthrophic zones blue-green algae (Oscillatoria agardhii) dominated and the largest phytoplankton biomass was in July-September while in the outer archipelago, it was in May. Diatoms and flagellates dominated offshore. Light was the limiting factor at the most polluted stations in summer; nutrients were limiting in the other stations. (Buchanan-Davidson--Wisconsin)
W76-03537

COMPETITIVE EXCLUSION AMONG THREE PLANKTONIC BLUE-GREEN ALGAL SPECIES,
Cincinnati Univ., Ohio. Tanner's Council Lab.
W. Lange.
Journal of Phycology, Vol 10, No 4, p 411-414, 1974. 3 tab, 8 ref.

Descriptors: *Competition, *Cyanophyta, *Deficient elements, Nutrients, Nostoc, Iron, Trace elements, Bacteria, Growth rates, Dominant organisms, Laboratory tests.
Identifiers: Microcystis aeruginosa, Phormidium foveolarum, Nostoc muscorum.

The decline of an algal species in a group of cyanophytes is apparently caused by an insufficient supply of certain nutrients. The effect of one algal species on growth of other members of a three species blue-green algal community was determined by measuring the modification of the rate of cell division. The bacteria-associated algae, Microcystis aeruginosa, Nostoc muscorum, and Phormidium foveolarum, were cultivated on Zehnder-Gorham's medium Number 11 individually and in combination. Growth rates of Microcystis and Nostoc were reduced by the presence of Phormidium. This effect was apparently not due to any toxic or allelopathic matter; when filtrates of a Phormidium culture were enriched and inoculated with Nostoc or Microcystis, there was no growth inhibition. Addition of Nutrients to the Phormidium filtrates showed that iron and trace metals were limiting; phosphorus and nitrogen were not lacking. Enrichment with iron and trace elements doubled Microcystis growth and increased Nostoc growth five times. Even in the absence of bacteria, Phormidium reduced the concentration of minor elements in the nutrient medium. This study showed that in a three-species algal system using a defined nutrient medium exhaustion of selected nutrient elements by one species may lead to exclusion of the other two species. (Buchanan-Davidson--Wisconsin)
W76-03538

LAKE HAKOJARVI, A POLYHUMIC LAKE IN SOUTHERN FINLAND,
P. O. Lehmusluoto, and R. Ryhanen.
Verhandlugen Internationale Vereinigung Limnologie, Vol 18, p 403-408, 1972. 4 fig, 9 ref.

Descriptors: *Lakes, *Humus, Particle size, Iron, Phosphorus, Trophic level, Euphotic zone, Limiting factors, Light penetration, Primary productivity.
Identifiers: *Lake Hakojarvi(Finland), Algal growth.

The humic components were of many sized fractions but the higher the humus concentration in the water, the higher was the proportion of large to small particles. Iron and phosphorus were found in large particles and calcium, magnesium, sodium, potassium, and manganese in small particles. The proportion of large:small particles increased with depth. In the laboratory algal growth increased with high humus concentrations, but light extinction by humus and phytoplankton can decrease growth in lakes. Phytoplankton primary production varied during the year. Enrichment with urea and phosphate before spring circulation caused increased nitrogen, phosphorus, and phytoplankton primary production. Humus stimulated algal growth in the laboratory but had a restraining effect in the lake, therefore this lake may be oligotrophic longer than a harmonic lake with equal enrichment. Nitrogen and phosphorus together may be limiting nutrients, as algal response was low with nitrogen or phosphorus alone. Autochtonous primary production is the energy source for heterotrophic life in polyhumic lakes. Glucose uptake increased when phytoplankton primary production increased. Glucose turnover time was about 200 hours in the epilimnion and 1000 hours in the hypolimnion. Oxygen was lacking in late winter; thus decomposition processes may be important in Lake Hakojarvi. (Buchanan-Davidson--Wisconsin)
W76-03540

DISEASES TRANSMITTED BY FOODS CONTAMINATED BY WASTE WATER,
Center for Disease Control, Atlanta, Ga.
F. L. Bryan.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 16-45. 179 ref, 8 tab.

Descriptors: *Waste water(Pollution), *Water pollution, *Human diseases, *Foods, Water reuse, Irrigation water, Aquiculture, Fish farming, Epidemics, Public health, Path of pollutants, Water pollution sources, Pollutants, Soil contamination, Food processing industry, Pathogenic bacteria, Pathogenic fungi, Sewage, Food chains, Publications, Reviews, Water pollution effects, Wastes, Municipal wastes, Industrial wastes.

Recycling wastewater for watering and nourishing food crops or for growing fish contributes to both food production and waste disposal. But when wastewater is used to irrigate crops or to provide water in aquaculture, appropriate precautions must be taken to prevent the diseases that might otherwise be transmitted by wastewater-contaminated foods. Foods can become contaminated during production either on farms or in watercourse, during processing in food processing plants, and during preparation in food service establishments and homes. The chain of events necessary for wastewater to contribute to foodborne outbreaks of human disease is reviewed, based on information from engineering and medical literature. The review covers pathogen survivals in sewage, in waste treatment processes, in receiving watercourses, during use of wastewater for irrigation, in soil, and in contaminated foods, as well as cross-contamination and multiplication during food processing, numbers of pathogens required to cause illness, and outbreaks of human illness associated with foods contaminated by sewage or wastewater. (See also W76-03541) (Witt-IPC)
W76-03544

THE EVALUATION OF MICROBIAL PATHOGENS IN SEWAGE AND SEWAGE-GROWN FISH,
Oklahoma State Dept. of Health, Oklahoma City.
R. L. Carpenter, H. K. Malone, A. F. Roy, A. L Mitchum, and H. E. Beauchamp.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 46-55. 3 fig, 20 ref.

Descriptors: *Sewage effluents, *Pathogenic bacteria, *Viruses, *Fish, Waste water treatment, Water pollution sources, Water pollution treatment, Waste treatment, Municipal wastes, Bacteria, Lagoons, Sewage treatment, Aeration, Aerated lagoons, Coliforms, Aquatic microorganisms, Oklahoma.
Identifiers: Quail Creek Sewage Lagoon(Oklahoma), Hinde Air-Aqua System.

Studies showed that pathogenic bacteria and viruses were rare in sewage and sewage-grown fish from the Quail Creek Sewage Lagoon system (located near Oklahoma City, Oklahoma). The lagoon system consists of six cells and serves a residential district of approximately 10,000 persons producing approximately one million gallons of sewage/day. The first two cells are aerated with the conventional Hinde Air-Aqua System; the four following are operated in series at a level of four to five feet. This study confirmed the observations of previous investigators that indicator coliform organisms are efficiently removed in a lagoon-method waste water treatment system. (See also W76-03541) (Witt-IPC)
W76-03545

MORBIDITY RISK FACTORS FROM SPRAY IRRIGATION WITH TREATED WASTE WATERS,
Texas Univ., Houston. School of Public Health.
G. B. Stanford, and R. Tuburan.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 56-64. 26 ref.

Descriptors: *Sprinkler irrigation, *Irrigation water, *Water reuse, *Human disease, *Sewage effluents, *Waste water disposal, Municipal wastes, Publications, Reviews, Public heal
Sewage, Wastes, Viruses, Diseases, Sewage tr
ment, Water pollution sources, Pollutants, Wa
treatment, Anaerobic digestion, Sludge, Sew
sludge, Management, Treatment facilities, Irr
tion, Waste disposal, Pathogenic bacteria.

A literature search has not revealed any incide
of huma disease outbreaks from spray irriga
with effluent from properly treated sew
(receiving at least secondary treatment)
pointed out that treatment by primary set
reduces the general pathogen load in the supe
tant waters and carries most of the viral load
the sludge. Properly conducted aerobic treatm
whether by biological filter or by the activ
sludge process, can reduce the non-viral path
load by better than 99%, although this is sel
achieved in practice. Disease outbreaks have
associated with primary settled sludge, but se
dary anaerobic treatment of sludges in a
which is not overloaded produces a sludge th
safe. While existing information does not wa
any restrictions on the use of properly tr
waste waters for land application, it does supp
case for careful management of sewage p
whose products are to be used in this way.
also W76-03541) (Witt-IPC)
W76-03546

**PERMISSIBLE LEVELS OF HEAVY MET
IN SECONDARY EFFLUENT FOR USE
COMBINED SEWAGE TREATMENT-MA
AQUACULTURE SYSTEM. I. MONITO
DURING PILOT OPERATION,**
Woods Hole Oceanographic Institution, Mas
W. B. Kerfoot, and S. A. Jacobs.
In: Wastewater Use in the Production of Foo
Fiber -- Proceedings, March 5-7, 1974, Okla
City, Oklahoma, p 65-78. 2 fig, 24 ref, 3 tab.

Descriptors: *Water pollution effects, *
metals, *Oysters, *Shellfish, *Aquicu
Sewage effluents, Water pollution sources,
pollution treatment, Zinc, Copper, Lead, C
um, Chromium, Nickel, Metals, Aquatic an
Mollusks, Commercial shellfish, Algae, A
algae, Toxicity, Taste, Foods, Public health
plants, Sewage, Domestic wastes, Ferti
Nutrients, Food chains.
Identifiers: Crassostrea virginica.

Domestic waste water inherently contains a
load of metals than the original source wat
to the treatment of water for algae c
leaching from pipes, and solutes added
household use. While nutrient-rich secon
treated waste water can serve as a fertili
aquaculture of commercially valuable alg
shellfish, excessive levels of metals in
may be toxic to the cultured organisms, a
late in the meat of food products to the e
posing a danger to public health if consu
impair the visual appeal and taste of the m
levels of Cd, Pb, Cu, Zn, Cr, and Ni in sec
ly-treated waste water, seawater, and
(Crassostrea virginica) during operation o
waste water-seawater aquaculture syste
studied. The 102-day study indicated thi
other potential contaminants, including pa
and organic compounds, need further in
tion to evaluate the advisability of sub
secondary effluent for artificial media in
ture, the inherent elevated metal concentr
domestic waste water do not appear to
threat to shellfish culture if effluent of
cipally domestic source is used. (See a
03541) (Witt-IPC)
W76-03547

**PERMISSIBLE LEVELS OF HEAVY
IN SECONDARY EFFLUENT FOR US
COMBINED SEWAGE TREATMENT-
AQUACULTURE SYSTEM. II. DEVELO
OF GUIDELINES BY METHOD O
TIONS,**
Woods Hole Oceanographic Institution,

Kerfoot, and G. A. Redmann.
astewater Use in the Production of Food and
-- Proceedings, March 5-7, 1974, Oklahoma
Oklahoma, p 79-101. 7 fig, 23 ref, 2 tab.

ptors: *Heavy metals, *Oysters, *Water
on effects, Water pollution sources, Sewage
nts, Water pollution treatment, Toxicity,
Copper, Lead, Cadmium, Chromium,
l, Metals, Algae, Aquiculture, Model stu-
Pollutants, Aquatic algae, Aquatic animals,
ks, Commercial shellfish, Shellfish, Food
, Nutrients.
iers: Phaeodactylum tricornutum, Crassos-
rginica.

udy attempts to define the concentrations
Cu, Pb, Cd, Cr, and Ni that are permissible
aste water-marine aquaculture system for
ng oysters (Crassostrea virginica). The
are cultured on algae (Phaeodactylum
utum) raised with secondarily-treated waste
substituted for artificial nutrients. The
ys of contamination and toxicity of the
to the algae and oysters are reviewed and
are given of the experimental procedures.
he toxicity studies, levels of metal above
, 0.5, 0.5, 1.0, and 1.0 ppm, respectively, for
l, Ni, Cr, Pb, and Zn may inhibit algal
if present in the effluent and would appear
ble. Few oysters died during the operation
scale model waste water-aquaculture
, probably because of the high dilution of
t before exposure to the oysters. An in-
in the level of metals in the sea-
ffluent media, in general, caused a progres-
e in the content of metal in the tissue of the
being cultured. The clearest pattern of ac-
tion occurred in the elements of lesser af-
or the oyster tissue, Cr, Ni, and Cd. The
tration of Pb showed a more abrupt rise
e other metals. Cadmium was the only ele-
o show detectable accumulation at 0.03
it also appeared to saturate at the highest
0 ppm). Some accumulation of Cu oc-
but no definite uptake of Zn could be
ed. Permissible levels of metals in a secon-
luent for use in a waste water-aquaculture
for raising oysters are given. (See also
541) (Witt-IPC)
548

T ON PILOT AQUACULTURE SYSTEM
DOMESTIC WASTEWATERS FOR
NG PACIFIC SALMON SMOLTS,
dt State Univ., Arcata, Calif. School of
Resources.
len, and L. Dennis.
ewater Use in the Production of Food and
Proceedings, March 5-7, 1974, Oklahoma
lahoma, p 162-198. 9 fig, 38 ref, 9 tab.

ors: *Salmon, *Sewage effluents, *Pilot
Aquiculture, Fish, Water pollution con-
ater pollution treatment, Sea water,
animals, Animal growth, Chinook salmon,
omestic wastes, Mortality.
rs: Oncorhynchus kisutch, Oncorhynchus
cha, Coho salmon.

ort presents results of 6 salmon-rearing
nts in seawater-sewage effluent mix-
ur experiments involved short-term rear-
fingerling coho salmon (Oncorhynchus
during summer through late-fall periods,
experiments involved rearing of chinook
ry (O. tshawytscha) during 3-4 months of
ring growing periods. A description is
he pond system and its operation. Results
ted in terms of survival and growth. The
n of salmon from the system varied
or coho fingerling planted in late summer
periods the trend was from moderate to
ivals, coupled with an inverse trend in ac-
production (high to low). The single ex-
with coho fingerlings reared during a
period showed a low survival and low production of salmon but a high survival and high production of other species of fish. Both survival and production of chinook salmon from fry plantings were low, although the chinook grew fast and smolted. Factors causing mortalities are discussed, along with evaluation of the results. (See also W76-03541) (Witt-IPC)
W76-03553

AN EXPERIMENT IN THE EUTROPHICATION OF TERRESTRIAL ECOSYSTEMS WITH SEWAGE: EVIDENCE OF NITRIFICATION IN A LATE SUCCESSIONAL FOREST,
Brookhaven National Lab., Upton, N.Y.
G. M. Woodwell, J. Ballard, J. Clinton, M. Small, and E. V. Pecan.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 215-228. 5 fig, 17 ref, 2 tab.

Descriptors: *Sewage effluents, *Eutrophication, *Ecosystems, *Nitrification, *Forests, Mixed forests, Coniferous forests, Pine trees, Oak trees, Sprinkler irrigation, Groundwater, Nutrients, Nitrates, Nitrogen, Plant groupings, Irrigation effects, Sewage treatment, Water pollution control, Water pollution treatment, New York, Percolation, Fertilizers, Soil disposal fields.
Identifiers: Timothy grass(Phleum pratense), Quercus alba, Quercus coccinea, Pinus rigida, Long Island.

Primary treated sewage and secondary treated sewage were applied to a field of timothy (Phleum pratense), an abandoned field, a 25-year-old pine (Pinus rigida) forest, and an oak-pine (Quercus alba, Q. coccinea, P. rigida) forest on long Island by spray irrigation. Percolation into the groundwater from the mature late successional oak-pine forest is normally low in major nutrients, especially nitrate-nitrogen. The agricultural communities and plant communities of early succession are leaky by comparison. The conversion of ammonium-ion nitrogen to nitrate occurred in the oak-pine forest during winter but not in the pine forest. There is little question that natural and agricultural communities can be used to treat sewage. However, any treatment system will require more than one plant community but there is little basis at present for speculation as to the combinations that will prove most useful. (See also W76-03541) (Witt-IPC)
W76-03555

IRRIGATION OF TREES AND CROPS WITH SEWAGE STABILIZATION POND EFFLUENT IN SOUTHERN MICHIGAN,
Williams and Works, Grand Rapids, Mich.
J. C. Sutherland, J. H. Cooley, D. G. Neary, and D. H. Urie.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 295-313. 1 fig, 8 ref, 9 tab.

Descriptors: *Sewage effluents, *Irrigation effects, *Deciduous trees, *Coniferous trees, *Forestry, Ash trees, Cottonwoods, Oak trees, White-cedar trees, Plant growth, Waste water disposal, Michigan, Forests, Coniferous forests, Coniferous forests, Deciduous forests, Red pine trees, Irrigation, Trees, Nitrogen compounds, Phosphorus compounds, Irrigation water.
Identifiers: Pinus resinosa, Populus deltoides x P. nigra, Populus canescens x P. grandidentata, Fraxinus pennsylvanica var. lanceolata, Liriodendron tulipifera, Thuja occidentalis, Larix decidua, Larix leptolepis, Quercus borealis.

The use of pond-stabilized sewage waste water for irrigation of hardwood and conifer plantings in southern Michigan has produced several distinct results after two years of treatment. Water quality monitored beneath a 20-year-old red pine (Pinus resinosa) plantation indicated 83-92% renovation of N, and 96% removal of P. Nitrate-nitrogen levels were greater under irrigation rates of 50 and 88 m/week than under 25 mm/week, but have remained below 1 mg/liter. The length and dry weight of red pine needles increased by as much as 36 and 56%, respectively, over those of unirrigated controls. Increases in diameter and height growth were not observed but are anticipated. Irrigation increased the survival and height growth of hardwood cuttings and seedlings. A cottonwood hybrid (Populus deltoides x P. nigra), an aspen hybrid (Populus canescens x P. grandidentata), and green ash (Fraxinus pennsylvanica var. lanceolata) exhibited the most dramatic responses to irrigation, growing an average of 112, 69, and 36 cm, respectively, in one year. Tulip poplar (Liriodendron tulipifera) and white-cedar (Thuja occidentalis), while producing less total growth, increased their growth by four and five times over the range of treatments. Irrigation produced moderate increases in height growth in European and Japanese larch (Larix decidua and L. leptolepis), but had little effect on red oak (Quercus borealis). (See also W76-03541) (Witt-IPC)
W76-03560

HYGIENIC EVALUATION OF EPOXY COMPOSITIONS INTENDED FOR USE IN WATER SUPPLY, (IN RUSSIAN),
Vsesoyunznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
V. O. Sheftel', Z. S. Tsam, and L. T. Kalinichenko.
Gig Sanit, 12: 81-82, 1974.

Descriptors: Water supply, *Public health, Filters, Resins, *Epoxy resins, Water quality, Water pollution effects, *Path of pollutants, *Lethal limit, Water quality standards, Rodents.
Identifiers: Acetone, Amines, Chlorohydrin compounds, Compositions, Propane.

The effects on water quality of water-main filters made of epoxy resin were studied. The migration of epichlorohydrin, polyethylene polyamine (PEPA), diphenylolpropane, dibutyl phthalate and acetone into the water was determined. The maximum tolerance and abolute lethal doses of an aqueous solution and pure PEPA for rats and mice were determined. The recommended maximum allowable concentration of PEPA is 0.15 mg/l.--Copyright 1975, Biological Abstracts, Inc.
W76-03561

THE DIALECTICS OF A PROPOSAL ON BIOLOGICAL CONTROL OF EUTROPHICATION IN SEWAGE LAGOONS,
National Taiwan Univ., Taipei.
S. Y. Lin.
In: Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 417-434. 2 fig, 31 ref, 1 tab.

Descriptors: *Sewage lagoons, *Fish stocking, *Water purification, *Biocontrol, *Eutrophication, Fish, Aquatic animals, Water pollution treatment, Water pollution control, Waste water treatment, Waste treatment, Water quality control, Biological treatment, Municipal wastes, Sewage treatment, Proteins, Stocking.

Existing lagoons for the deposition of municipal sewage face the problems of extreme eutrophication and of discharging polluted effluents into public waters. Mechanical purification is too expensive. A proposal is made to stock the lagoons with fish (plankton-feeding fishes, filamentous algae eaters, bottom feeders, and scavengers) to purify the sewage water. In addition to puriyfing the sewage water, the fish can be harvested as a source of animal protein. (See also W76-03541) (Witt-IPC)
W76-03570

THE FEASIBILITY OF PENAEID SHRIMP CULTURE IN BRACKISH PONDS RECEIVING TREATED SEWAGE EFFLUENT,
North Carolina State Univ., Raleigh.

W. L. Rickards.
In. Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 504-512. 2 fig, 11 ref, 1 tab.

Descriptors: *Water pollution effects, *Shrimp, *Brackish water, *Sewage effluents, *Aquiculture, Animal growth, Crustaceans, North Carolina, Aerated lagoons, Aeration, Water pollution treatment, Water pollution control, Dissolved oxygen, Hydrogen ion concentration, Water temperature, Growth rates, Aquatic animals, Stocking.
Identifiers: Penaeus setiferus.

Previous studies showed that juvenile white shrimp (Penaeus setiferus) survived and grew in ponds containing brackish tidal creek water but failed to survive in ponds containing brackish water plus treated sewage effluent (sewage ponds). In this study the sewage ponds were aerated and again stocked with shrimp. Aeration maintained dissolved oxygen well above the minimum desirable level of 3 mg/liter. Aeration had no detectable effect on water temperature, but diurnal fluctuations in pH were moderated. The shrimp survived and grew well in the aerated ponds, gaining 13.4 grams in approximately 70 days or 0.97 mm in length per day. Such growth compares favorably to that of shrimp in natural populations in North Carolina. (See also W76-03541) (Witt-IPC)
W76-03573

STANDING CROPS OF BENTHIC FAUNA IN MARINE AQUACULTURE PONDS USING RECLAIMED WATER,
Humboldt State Univ., Arcata, Calif.
T. R. Sharp.
In: Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma, City Oklahoma, p 513-528. 2 fig, 17 ref, 6 tab.

Descriptors: *Benthic fauna, *Aquiculture, *Water pollution effects, *Standing crops, *Sewage effluents, Water pollution sources, Mud, Sands, Gravels, Oysters, Estuarine environment, Sea water, Amphipoda, Daphnia, Aquatic populations, Fish, Fish food organisms, Aquatic life, Benthos, Worms, Reclaimed water, Brackish water, Tidal effects, Bottom sediments.
Identifiers: Shells, Capitella capitata, Polydora ciliata, Anisogammerus confervicolus, Corophium spinicorne, Polychaete.

Comparisons were made of the benthic fauna growing on mud, sand (Hookton soil), river-run gravel, and oyster shells in an unfertilized pond (estuarine pond tidally flushed every 2-3 weeks) and a fertilized pond (static seawater-sewage effluent mixture). The organisms found in the ponds included two species of polychaete, Capitella capitata and Polydora ciliata, and two species of gammarid amphipod, Anisogammerus confervicolus and Corophium spinicorne. Daphnia species shells were found in large numbers but were considered artifacts. Other species occurred in low numbers. Both P. ciliata and A. confervicolus had significantly higher populations in the fertilized pond than in the unfertilized pond. C. capitata and C. spinicorne standing crops did not differ between ponds, with C. capitata having large populations and C. spinicorne having extremely low populations. Only C. capitata and A. confervicolus varied with substrate; C. capitata had the largest populations on sand and A. confervicolus populations were largest on oyster shell and gravel. The changes in fauna with time and the effects of fish on fauna populations are also discussed. Population of the fish food fauna, such as A. confervicolus, could conceivably be increased by covering the mud substrate (and perhaps even the sand) with oyster shells or gravel. (See also W76-03541) (Witt-IPC)
W76-03574

CONTROLLED EUTROPHICATION: SEWAGE TREATMENT AND FOOD PRODUCTION,
Texas Univ. Medical Branch at Galveston.
For primary bibliographic entry see Field 5D.
W76-03575

THE TUXTEPEC PAPER MILL (OAXACA, MEXICO) AND POLLUTION OF THE PAPALOAPAN RIVER (LA FABRICA DE PAPEL TUXTEPEC Y LA CONTAMINACION DEL RIO PAPALOAPAN),
Fabricas de Papel Tuxtepec, S.A., Oaxaca (Mexico).
I. Montelongo, and G. Ortiz y Leon.
ATCP (Asociacion Mexicana de Tecnicos de las Industrias de la Celulosa y del Papel), Vol 15, No 4, p 195-204, July/August, 1975. 8 fig, 4 ref, 7 tab, English summary.

Descriptors: *Pulp wastes, *Water pollution, *Mexico, Foreign countries, Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Rivers, Water quality standards, Sewage treatment, Waste water treatment, Waste treatment, Pulp and paper industry.
Identifiers: Newsprint, Bleached pulp, Chemical pulp, Mechanical pulp, Zinc dithionite, Fiber recovery, Papaloapan River(Mexico).

The characteristics of effluents discharged into the Papaloapan River from the Tuxtepec Paper Mill are tabulated. The Tuxtepec mill produces 165 tons/day of newsprint from 21% semibleached chemical pulp and 79% mechanical pulp. Zinc dithionite is the principal bleaching agent used. The characteristics of the river water, including BOD levels, are also tabulated. At present the mill is studying means of meeting pollution control standards with a primary treatment system which would also serve as a fiber recovery system. (Sykes-IPC)
W76-03577

EFFECT OF ZINC ON THE MOVEMENT PATTERN OF THE MINNOW PHOXINUS PHOXINUS L.,
Umea Univ. (Sweden). Dept. of Biology.
B. E. Bengtsson.
Water Research, Vol 8, p 829-833, 1974, 3 fig, 1 tab, 17 ref.

Descriptors: *Heavy metals, *Zinc, *Minnows, Aquatic life, Aquatic environment, *Fish behavior, *Fish toxins, Water pollution effects.
Identifiers: *Phoxinus phoxinus L.

A shoal of 30 minnows, Phoxinus phoxinus L., was studied to determine the effects of sublethal concentrations of zinc on their behavioral patterns. After an initial 24 day control period, Zn(NO3)2 was added as a solution in distilled water and diluted about 100 times by a dosing apparatus. The concentration was raised successively for six days and then kept at 0.38-0.39 ppm zinc for 9 days. The dosing was then stopped and the concentration of zinc decreased gradually to its initial value. The results indicate that the addition of zinc produces an initial period of hyperactivity which occurs within 3 days of the first dose of zinc. This behavior is followed by a period of hypoactivity. There were also changes in the distribution between diurnal and nocturnal activity. The possible causes and further reaching consequences of such behavioral changes are discussed. (Hoyle-Vanderbilt)
W76-03582

POTENTIAL EFFECTS OF AQUACULTURE ON INSHORE COASTAL WATERS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
W. E. Odum.
Environmental Conservation, Vol 1, No 3, p 225-230 (Autumn 1974). 6 p, 33 ref.

Descriptors: *Eutrophication, *Aquicul
*Effluents, *Environmental effects, *Dise
Sediment discharge, Sedimentation, Plankton,
ygenation, Microorganisms, Ponds, Ben
Algal toxins, Biochemical oxygen demand,
lations, Habitats, Water quality control,
farming, Estuaries, Fish hatcheries, To
Dredging, Marshes, Parasitism.
Identifiers: *Introduction of exotic organ
*Raft culture, Walking catfish, Hazardous
stances(Pollution).

Construction and operation of aquaculture
ties generates a wide variety of environment
fects, some of which are potentially ha
Frequently encountered detrimental resul
aquaculture are surveyed. These include
changes induced in native animal and plant p
tions; (2) pH changes in water used; (3) low
solved oxygen concentrations; and (4) incr
biochemical oxygen demand (BOD). A
frequent problem is sedimentation, especi
culturing of oysters and mussels. Perhaps th
dangerous side effects, however, arise with
troduction of exotic organisms to environ
not capable of controlling them. The takeo
Florida's inland waters by tropical fish im
from other countries, and new disease
which are hazardous to native organisms
man are prime examples. While there are
tions controlling aquaculture, the aquacult
dustry has successfully resisted regulating
in some areas. (Parrish-Florida)
W76-03585

**MICROBIAL-MALATHION INTERACTI
ARTIFICIAL SALT-MARSH ECOSYSTEM
FECT AND DEGRADATION,**
Environmental Protection Agency, Gulf
Fla. Gulf Breeze Environmental Research
For primary bibliographic entry see Field 5
W76-03634

**THE DESIGN OF A MARINE ENVIRO
TAL SIMULATION SYSTEM,**
Data Industries Inc., East Providence, R.
Data Equipment Div.
For primary bibliographic entry see Field 5
W76-03643

**EFFECTS OF SUSPENDED SOLI
SOCIATED WITH DREDGING OPER
ON ESTUARINE ORGANISMS,**
Army Engineer District, San Francisco, C
T. Wakeman, R. Peddicord, and J. Sustar
IEEE Ocean '75 Record, p 431-436, 197
tab, 6 ref.

Descriptors: *Sediments, *Suspended
*Disposal, *Dredging, Benthic
Ecosystems, Temperature, Dissolved
Water pollution effects.

The suspended solids concentrations du
ous dredging and disposal operations in
cisco Bay were monitored. The results
tegrated with the results of a suspended
performed at the Bodega Marine Lab
develop a matrix of potential adverse eff
digenous organisms under various
solids loadings. The matrix indicated
winter conditions of low temperature an
solved oxygen adults of most species
be adversely influenced during periods
dredging or disposal. However, durin
months, if temperature increased to
and dissolved oxygen dropped below 2
tality of sensitive species in the lo
column could result during disposal
(Klein)
W76-03645

**COMPARATIVE UPTAKE
POLYCHLORINATED BIPHENYL A**

BY THE WHITE SUCKER
AOSTOMUS COMMERSONI),
gan Univ., Ann Arbor. School of Natural
rces.
Frederick.
l of the Fisheries Research Board of
a, Vol 30, No 10, p 1705-1709, 1975. 1 fig, 2
ef.

ptors: *Suckers, *Chlorinated hydrocarbon
des, *Dieldrin, Aroclors, *Polychlorinated
yls, Uptake, Metabolism, Toxicity, Path of
nts, Analytical techniques, Fish physiolo-
ter pollution effects.
ers: *White suckers, *Catostomus com-
i, *Aroclor 1232, *Bioaccumulation, Tissue
s.

uckers (Catostomus commersoni) accumu-
he PCB Aroclor 1232 and dieldrin from
t approximately the same rate. However,
cumulated higher PCB levels than dieldrin
hen exposed to equivalent concentrations
substances. The uptake pattern of Aroclor
mponents on a whole fish basis and in gill
estinal tissue was similar to Aroclor 1232
ents to which the fish were exposed. The
e of additional components having short
tographic retention tissues was observed in
rain, and kidney tissues in fish exposed
Aroclor 1232. (Klein)
546

ETHAL AND SUBLETHAL EFFECTS OF
ONIUM PROCESS EFFLUENT ON JU-
E SALMONIDS,
State Univ., Corvallis. Dept. of Fisheries
dlife.
binson-Wilson, and W. K. Seim.
Resources Bulletin, Vol 11, No 5, p 975-
ober 1975. 5 fig, 2 tab, 18 ref.

ors: *Salmonids, *Coho salmon,
k salmon, Effluents, *Ammonium com-
*Toxicity, Chlorides, Ammonia, Juvenile
tage, Growth rates, Water quality, Lethal
ter pollution effects.
rs: Oncorhynchus tshawytscha, Oncor-
kisutch, Ammonium chloride,
m process effluents.

ent (ZPE) with high concentrations of am-
as compared with solutions of ammonium
in both lethal and sublethal tests on ju-
lmonids (Oncorhynchus tshawytscha and
h). The ZPE was more toxic than were
of ammonium chloride in acute toxicity
hough ammonia was shown to be the
xicant. Growth was used as a sublethal
neter and ZPE was again more toxic than
m chloride solutions at the same am-
ncentrations. Concentrations of ammonia
3 mg/liter in ammonium chloride solu-
ually stimulated the growth of juvenile
almon. (Klein)
7

NIFICANCE OF DIISOCYANATE STA-
IN WATER IN HYGIENIC STAN-
ATION, (IN RUSSIAN),
tvo Zdravookhraneniya S.S.S.R.
Institut Biofiziki.
ry bibliographic entry see Field 5B.
8

LOGICAL EFFECTS OF FISH
RY DISCHARGE,
y's Coll., Winona, Minn.
ha.
Fish Soc, 102(2): 226-234, Illus. 1974.

rs: *Fish hatcheries, *Michigan,
n, *Waste water treatment, Oxygen,
esins, Nitrogen, Phosphorus, Potamolo-
pollution effects.

Identifiers: Jordan River(Mich), *Fish hatery wastes.

The ecological impact of fish hatchery wastes on periphyton production rates and O2 balance were determined in the Jordan River from March through June, 1971 and 1972. The hatchery, located in the Jordan Valley, utilizes 2 systems of tributary springs for its water supply. Until spring 1972 the hatchery was discharging its untreated wastes into the Jordon River but during winter, 1971 and 1972, 2 settling basins were built to remove 80-95% of setteable solids from the wastewater. The Jordan Valley National Fish Hatchery discharged the approximate equivalent of 898 kg of elemental P and 4170 kg of elemental N between July 1970 and June 1971, and 998 kg of P and 4604 kg of N between July 1971 and June 1972. These quantities comprised approximately 28% and 5% of the annual load of P and N, respectively, in the Jordan River at the vicinity of the hatchery. Periphyton production rates increased exponentially during the study periods. Mean production rates were 7 times greater below the outfall than at the control stationabove the discharge in 1971 and 5 times greater in 1972. Although periphyton production rates were increases below the outfalls, O2 balance was not affected significantly by the hatchery effluent, either before or after installation of settling basins. (See also W74-03903)--
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W76-03650

HISTORICAL CHANGES IN MERCURY CONTAMINATION IN MICHIGAN WALLEYES (STIZOSTEDION VITREUM VITREUM),
Michigan Univ., Ann Arbor. Great Lakes Resource Management Program.
For primary bibliographic entry see Field 5B.
W76-03652

ENVIRONMENTAL FACTORS AFFECTING THE STRENGTH OF WALLEYE (STIZOSTEDION VITREUM VITREUM) YEAR-CLASSES IN WESTERN LAKE ERIE, 1960-70,
Bureau of Sport Fisheries and Wildlife, Sandusky, Ohio. Biological Station.
W-D. N. Busch, R. L. Scholl, and W. L. Hartman.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1733-1743, 1975. 6 fig, 4 tab, 23 ref.

Descriptors: Freshwater fish, *Commercial fishing, *Environmental effects, *Fish reproduction, Spawning, Heated water, Temperature, Life cycles, Currents(Water), Biomass, Productivity, Annual turnover, *Walleye, *Lake Erie, Lakes.
Identifiers: Year-classes.

Commercial production of walleyes (Stizostedion vitreum vitreum) from western Lake Erie declined from 5.9 million pounds in 1956 to 140,000 pounds by 1969. Since 1956, marked irregularity in year-class success has developed. Only four year-classes were considered good during 1959-70. The rate and regularity of water warming during the spring spawning and incubation periods in 1960-70 has a positive effect on the density of egg deposits and the resulting year-class strength. Rates of warming were not themselves detrimental, but rather the extended length of the incubation period in cool springs increased the exposure of eggs to such negative influences as dislodgement from the spawning reefs by strong current action generated by spring storms, or siltation and low oxygen tensions. The annual brood stock size had much less influence on year-class strength than did water temperature. Reproductive success was unrelated to fluctuations in size of suitable reef spawning area caused by changes in water level. Apparently the usable spawning area at any water level was more than adequate to serve the limited walleye brood stocks. (Klein)
W76-03653

SIGNIFICANCE OF DETRITUS OR DETRITUS-ASSOCIATED INVERTEBRATES TO FISH PRODUCTION IN A NEW IMPOUNDMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and, Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
D. S. Cherry, and R. K. Guthrie.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1799-1804, 1975. 2 fig, 1 tab, 18 ref.

Descriptors: *Detritus, *Fish diets, *Growth rates, Nutrient requirements, Biomass, Sediments, Invertebrates, Cladophora, Copepods, Diptera, Sunfishes, Carp, Bullheads, Bass, Primary productivity, Impoundments.
Identifiers: *Food sources, *Feeding habits, Coleopterans, Pickeral, Cyprinus carpio, Ictalurus platycephalus, Micropterus salmoides, Esox niger.

During early stages of succession in a new impoundment, fish species that could assimilate the readily available food resources, i.e. carp (Cyprinus carpio) and flat bullhead (Ictalurus platycephalus) were initially favored in numbers and weight. Detrital feeders or amnivores represented by carp and the flat bullhead comprised a majority of the numbers (56%) and weight (65%) of the 25 species captured during a 2-yr period. Numbers of the major fish groups captured decreased from 1971 to 1972, while the weight per species increased. On a volumetric basis, detritus and detritus-associated invertebrates (coleopterans and dipterans) were the major food items consumed by carp and catfish. Relative abundance of animal food items, in terms of frequency of occurrence and percentage of stomach contents, was greater at warmer water temperatures. In comparison to other species, catfish contained the greatest diversity of food items during warmer months and consumed larger quantities of detritus in the winter. Fish groups that constituted a smaller biomass, such as centrarchids, were generally insectivorous or fed upon cladocerans and copepods, while adult bass (Micropterus salmoides) and (M. coosae) and chain pickerel (Esox niger) were piscivorous. (Klein)
W76-03654

YELLOW PERCH (PERCA FLAVESCENS) BIOMASS RESPONSES TO DIFFERENT LEVELS OF PHYTOPLANKTON AND BENTHIC BIOMASS IN LAKE MEMPHREMAGOG, QUEBEC-VERMONT,
McGill Univ., Montreal (Quebec). Dept. of Biology.
B. S. Nakashima, and W. C. Leggett.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1785-1797, 1975. 6 fig, 7 tab, 61 ref.

Descriptors: *Perches, *Biomass, *Productivity, Benthos, *Phytoplankton, Nutrient requirements, Life cycle studies, Ecosystems, Population, Growth rates, Size, *Canada, Vermont, *Yellow perch, *Benthos.
Identifiers: *Lake Mamphremagog(Quebec).

Yellow perch (Perca flavescens) biomass in Lake Memphremagog, Quebec, was 2.5 times greater in the more productive south than in the north basins which correlated with the biomass differences in the phytoplankton (1.6 times) and benthic (3x) communities. Growth was similar in both basins and independent of production at the lower trophic levels. Perch growth in both basins was though to be controlled by the length of the growing season. Abundance levels were fixed by the fourth year and possibly prior to reaching the second year of life. Perch biomass responses to different food levels provided empirical support to Moore's (1941) suggestion that at abundant food levels, population size and not growth is enhanced. (Klein)
W76-03655

UPTAKE AND LOSS OF PETROLEUM HYDROCARBONS BY THE MUSSEL, MYTILUS EDULIS, IN LABORATORY EXPERIMENTS,
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 5A.
W76-03656

EPIZOOTIOLOGY OF TUMORS IN A POPULATION OF JUVENILE ENGLISH SOLE (PAROPHRYS VETULUS) FROM PUGET SOUND, WASHINGTON,
Washington Univ., Seattle. Fisheries Research Inst.
C. L. Angell, B. S. Miller, and S. R. Wellings.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1723-1732, 1975. 2 fig, 4 tab, 22 ref.

Descriptors: *Marine fish, *Fish diseases, Juvenile growth stage, Sampling, Analytical techniques, Life cycles, Seasonal, Fish genetics, Fish parasites, Nutrient requirements, Life history studies, Fish physiology, Epidermis, *Washington, Water pollution effects.
Identifiers: *English sole, *Parophrys vetulus, *Epizootiology, Tumors, Tissue analysis, Angioepithelial nodules, *Puget Sount(Wash).

An epizootic skin tumor disease affected young-of-the-year English sole (Parophrys vetulus) near Seattle, Wash. The 1969 year-class had an incidence of 18.7%. The epizootic wave began in August and peaked in October. Incidence rapidly declined thereafter. The disease coincidentally attacked winter and summer influxes. There was no difference in growth between age-group 0 normal and tumorous fish, but age distribution of tumorous fish indicated longevity differed. Tumors were more numerous on younger fish. Angioepithelial nodules grew until transforming into epidermal papillomas, which reached maximum weight in age-group II. There were no differences in sex ratios between normal and tumorous fish. (Klein)
W76-03657

PLANKTONIC ECOSYSTEMS. THE EFFECTS OF DYSTROPHIC CONDITIONS ON STRUCTURE AND FUNCTION IN THE GULF OF FOS (ECOSYSTEME PLANCTONIQUE. STRUCTURE ET FONCTIONNEMENT EN RELATION AVEC DES PHENOMENES DE DYSTROPHIE (GOLFE DE FOS)),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Hydrobiologie Marine.
F. Blanc, M. Leveau, and M-C. Bonin.
Internationle Revue der gesamten Hydrobiologie, Vol 60, No 3, p 359-378, 1975. 20 fig, 4 tab, 23 ref.

Descriptors: *Effluents, *Dystrophy, *Plankton, *Diatoms, *Dinoflagellates, *Ecosystems, Water quality, Aquatic microorganisms, Reproduction, Metabolism, Brackish water, Rivers, Life history studies, Biological communities, Trophic level, Water pollution effects.
Identifiers: Skeletonema costatum, Exuviaella, Prorocentrum, Acartia, *Gulf of Fos(France).

Due to industrial and natural effluents from the Rhone and Durance rivers, unusual structure and dynamic behavior were exhibited by the plankton ecosystem. The ecosystem was kept at a low state of maturity, which was characterized by frequent periods of intense multiplication by small species with high metabolic rates. These species include the diatom, Skeletonema costatum, and the dinoflagellates Exuviaella and Prorocentrum. Brackish water seemed condusive to this type of proliferation. The turnover rate of these populations decreased with age and increse in cell size was evident. The lack of competition by species of the same genus was characteristic of the photo-autotrophic organisms in these environments. Secondary production followed the same cycle as the primary production by the dinoflagellates. Zooplankton species of the genus Acartia showed periods of intense development in these areas. (Klein)
W76-03658

MAN-MADE EUTROPHICATION IN A NEWFOUNDLAND (CANADA) HARBOUR,
Queens Univ., Kingston (Ontario). Dept. of Biology.
M. F. Frecker, and C. C. Davis.
Internationale Revue der gesamten Hydrobiologie, Vol 60, No 3, p 379-392, 1975. 6 fig, 2 tab, 53 ref.

Descriptors: *Eutrophication, *Phytoplankton, *Nanoplankton, Sewage, Euglena, Harbors, Water pollution effects, Water quality, Primary productivity, Biomass, Salinity, Temperature, Oxygen, Sampling, Bioindicators, *Canada.
Identifiers: *St. John's Harbour(Newfoundland).

A comparative study in 1969-1970 of the phytoplankton and certain other parameters in St. John's Harbour and Aquaforte Harbour, located on the southeast coast of Newfoundland, led to the conclusion St. John's Harbour which receives untreated sewage as a prime source of nutrients was by far the more eutrophic. Evidence for the eutrophic state was especially observed in the central basin of the harbour. Here the bottom waters were deficient in oxygen especially during the summer months. Secchi disc readings were generally lower at this station, and the annual standing crop of phytoplankton was almost three times that at unpolluted Aquaforte Harbour. Also the proportion of the biomass contributed by the nanoplankton was greater in St. John's Harbour. One euglenoid occurred in bloom concentrations throughout the summer months and may possibly be considered as an indicator of organically-polluted waters. (Klein)
W76-03659

EFFECTS OF A SANITARY LANDFILL ON GROUNDWATER QUALITY IN ASHLAND, NEW HAMPSHIRE,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
P. B. Briggs.
Master's Thesis, September 1974. 55 p, 15 fig, 10 tab, 20 ref, append.

Descriptors: *Water pollution, *Groundwater, *Landfills, *New Hampshire, Solid wastes, Alluvial aquifers, Soil water, Water quality, Leaching, Leachate, Path of pollutants, On-site investigations, Sampling, Water analysis, Chemical analysis, Oxygen demand, Dissolved solids.
Identifiers: *Wool wastes, *Ashland(NH).

A study of the effect of landfill leachate on the groundwater quality under a landfill was begun in 1972 in Ashland, New Hampshire. Water samples were taken from the unsaturated zone with vertically stacked suction lysimeters, and from the groundwater by observation wells. Field measurements included water level in the observation wells, temperature, electrical conductivity, and pH. Laboratory measurements were made of pH, electrical conductivity, total Fe, Ca, Mg, Na, K, HC03, S04, C1, N03, total P04, BOD, and COD. The landfill had minimal effect on the groundwater quality of the site during the first 16 months of operation. Concentrations of the chemical parameters were low; for example, chlorides never exceeded 30 mg/1, nitrates were consistently less than one mg/1, and there was essentially no BOD and COD. However, dissolved solids in the soil water increased slightly with time, and the beginning of an upward trend was noted in two observation wells. Wool wastes deposited in the landfill by a local woolen mill may be a significant factor in retarding the leachate movement to the groundwater. Filtering action of the wool may also be playing a major role in renovation process of the leachate. The wool wastes have a high porosity, low permeability, and a high field capacity. (Gibb-ISWS)
W76-03721

THE ECOLOGY OF SUBLITTORAL COM
NITIES AT ABEREIDDY QUARRY,
BROKESHIRE,
University Coll. of North Wales, Bangor. De
Marine Biology.
K. Hiscock, and R. Hoare.
Journal of the Marine Biological Associati
the United Kingdom, Vol 55, p 833-864, 1
fig, 5 tab, 57 ref.

Descriptors: Communties, *Distribution pat
*Ecosystems, *Biological communities, S
tion, Bodies of water, Bays, Sediments,
rents(Water), Rhodophyta, *Litoral.
Identifiers: *Sublittoral communities,
volutacornis, Ascidia mentula, Halopteris fi
Echinoderms, Barnacles, Bryozoa, Suspe
Feeders.

During the summer months at Abereiddy Q
a saline marine basin, there was a marke
mocline at 12-14m below which water
degrees C colder, had a lower light transmi
was deoxygenated and had a high le
hydrogen sulphide. Above the thermocline
surfaces were characterized by a small num
species common within the quarry but
served, or rare, outside. Compared with th
coast, the fauna of the quarry showed a re
in the abundance and variety of erect b
barnacles and echinoderms together wi
absence of many hydroids and of Alc
digitatum. Within the quarry an abundance
tive suspension feeders was found. The lam
forest and red algae found outside were
from within the quarry, but some filamen
and Halopteris filicina were abundant. The
water movement within the quarry, which
in siltation and a lack of current-borne f
passive suspension feeders mainly accoun
the differences in speciation. Below 10m d
was reduced. (Klein)
W76-03763

NATURAL FLUCTUATIONS IN A SOF
TOM BENTHIC COMMUNITY,
University Coll. of North Wales, Menai
Marine Science Labs.
R. A. Eagle.
Journal of the Marine Biological Associ
the United Kingdom, Vol 55, p 865-878,
fig, 3 tab, 31 ref.

Descriptors: *Surveys, *Benthic
*Speciation, Population, Distribution
Ecosystems, Biological communities, D
organisms, Sediments.
Identifiers: Deposit feeders, Filter feed
tinaria koreni, Lanice conchilega, Abra alb

Between 1970 and 1974 eight surveys w
of the benthic fauna in a coastal area.
variations were evident from survey to
especially in the muddy sand regions. Us
of three species (Pectinaria koreni,
conchilega and Abra alba) was numerica
nant. Changes in dominant species, feedi
and diversity were discussed and hypothe
suggested in light of these fluctuations. (K
W76-03765

BIOCONCENTRATION OF
TETRACHLOROBIPHENYL IN R
TROUT AS MEASURED BY
CELERATED TEST,
Dow Chemical Co., Midland, Mich. Env
tal Sciences Research.
D. R. Branson, G. E. Blau, H. C. Alexand
W. B. Neely.
Transactions of the American Fisheries
No 4, p 785-792, 1975. 3 fig, 3 tab, 19 ref.

escriptors: *Rainbow trout, *Salmonids, *Trout, esting procedures, Methodology, Organic com-ounds, Fish physiology, Equilibrium, Kinetics, esticides kinetics, *Polychlorinated biphenyls, Absorption.
entifiers: *Tetrachlorobiphenyl, Bioaccumulation, Tissue analysis.

n accelerated test procedures for measuring the oconcentration potential of chemicals in fish, sed on kinetics, was developed using an isomer PCB's: 2,2',4,4'-tetrachlorobiphenyl. The rates uptake and clearance of the compound were termined by analysis of rainbow trout (Salmo irdneri). The bioconcentration factor at steady-te uptake and clearance was determined by the celerated test procedure and was compared to perimental observations in a 42-day test. The 42-y level was found to be 43% of the theoretical ady-state of the compound. This accelerated ocedure was found to provide information con-rning the potential of a chemical to bioconcen-te in fish in a much shorter time than previously scribed methods. (Klein)
76-03766

FECT OF AERIALLY-APPLIED ALATHION ON JUVENILE BROWN AND HITE SHRIMP PENAEUS AZTECUS AND P. TIFERUS,
xas Agriculture Extension Service, College Sta-n.
S. Conte, and J. C. Parker.
nsactions of the American Fisheries Society, 4, p 793-799, 1975. 1 fig, 4 tab, 13 ref.

scriptors: *Shrimp, *Crustaceans, *Pesticides, arshes, Juvenile growth stage, Water quality, ine water, Mortality, Pesticide residues, Water lution effects, Toxicity.
ntifiers: *Penaeus aztecus, *Penaeus setiferus, alathion, Bioaccumulation, Tissue analysis.

e effect of the standard serial application of athion used in mosquito-control on juvenile wn and white shrimp, Penaeus aztecus and P. ferus was examined in a saline marsh. Water mples contained a high concentration of athion immediately after application and a gressive reduction thereafter. Shrimp at treated ions exhibited mortalities ranging from 14-%. Malathion concentrations in live shrimp en from the test sites were consistently higher n those measured in dead shrimp removed in same time period. (Klein)
5-03767

MBINED EFFECTS OF CADMIUM AND LINITY ON DEVELOPMENT AND SUR-AL OF FLOUNDER EGGS,
ogische Anstalt Helgoland (West Germany).
'on Westernhagen, and V. Dethlefsen.
nal of the Marine Biological Association of United Kingdom, Vol 55, p 945-457, 1975. 4 2 tab, 56 ref.

criptors: *Marine fish, *Salinity, *Cadmium, h eggs, Toxicity, Embryonic growth stage, er quality, Metals, Fish physiology, Water ution effects.
tifiers: *Baltic flounder, Pleuronectes flesus, hing rates, Survival, Bioaccumulation.

of Baltic flounder (Pleuronectes flesus) were bated in cadmium contaminated seawater (0.0-pm) at four salinities (16, 25, 32, 42%). Effects admium on embryonic survival and viable h were not dependent on the salinity of the in-ting water. At all salinities hatching rates and e hatch were not adversely affected by cad-n concentrations up to 1.0 ppm. Higher con-rations up to 5.0 ppm caused marked decrease atching rates and viable hatch. Mean total h, eye and otic capsule diameter did not ap-to be adversely affected by cadmium concen-ons in the rearing medium. Cadmium content of eggs was generally higher in lower salinities than in more saline water of comparable cadmium concentrations. (Klein)
W76-03768

SMALL-SCALE CULTIVATION OF CELLS AND TISSUES FROM GOBID TELEOSTS,
Bristol Univ. (England). Dept. of Zoology).
C. J. Webb.
Journal of Marine Biological Association of the United Kingdom, Vol 55, p 933-938, 1975. 1 fig, 1 tab, 10 ref.

Descriptors: Methodology, *Design, Analytical techniques, *Teleosts, *Fish physiology, Enzymes, Saline water, Laboratory tests, *Cytological studies, Chromosomes.
Identifiers: Pomatoschistus minutus, Pomatoschistus microps, Tissue analysis.

A small-scale system was developed for culturing specific cells and tissue derived in restricted quantities from the sand goby Pomatoschistus minutis and P. microps. Cell outgrowth was recorded from fin, skin, heart and spleen tissue of gobiid teleosts in media containing mammalian levels of sodium chloride, but media adjusted with 3-4 grams/liter of additional salt supported outgrowth from only fin and skin tissue. Suspensions of fin and gill cells were obtained by enzymatic digestion of tissue from an individual fish and were grown to confluence in salt-adjusted (fin and gill) or unadjusted (fin) media. (Klein)
W76-03769

ACID ROCK IN THE GREAT SMOKIES: UNANTICIPATED IMPACT ON AQUATIC BIOTA OF ROAD CONSTRUCTION IN REGIONS OF SULFIDE MINERALIZATION,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
J. W. Huckabee, C. P. Goodyear, and R. D. Jones.
Transactions of the American Fisheries Society, No 4, p 677-684, 1975. 5 tab, 15 ref.

Descriptors: *Hydrogen ion concentration, *Acids, *Road construction, *Fishkill, Sediment control, Sulfides, Water quality, Salmonids, Toxicity, Brook trout, Mortality, Leaching, Salamanders, Path of pollutants, Metals.
Identifiers: *Great Smoky Mountains National Park, Salvelinus fontinalis, Leurognathus marmoratus.

After the completion of a highway construction project in Great Smoky Mountains National Park in 1963, a fish kill was noted in a small stream draining an area of roadbed fill. After ten years, the stream remained devoid of fish for at least 8 km downstream from the fill. The downstream water a pH of 4.5 to 5.9; upstream from the fill the pH was 6.5-7.0. The rock material in the fill contains iron sulfide minerals. Ohter streams in the area flowing on the sulfide-rich rocks also showed low pH values. Survivability tests and stream surveys showed that brook trout could not tolerate conditions in the stream below the road fill or in a stream flow over natural outcrops of the same rock used in construction of the road fill. Native salamanders were also adversely affected downstream from the road fill. Chemical analyses of stream water and leaching tests indicated that lowered pH and increased sulfate and metals concentrations derived from the leaching of the sulfide-rich rocks were responsible for the trout and salamander mortalities. (Klein)
W76-03770

A CRITICAL COMPARISON OF THE BIOLOGICAL ASSUMPTIONS OF HUDSON RIVER STRIPED BASS MODELS AND FIELD SURVEY DATA,
Power Authority of the State of New York.
D. N. Wallace.
Transactions of the American Fisheries Society, No 4, p 710-717, 1975. 1 fig, 1 tab, 34 ref.

Descriptors: *Striped bass, *Powerplants, Legal aspects, Surveys, Population, Life cycles, Model studies, Distribution patterns, Water quality, *Hudson River, *New York.
Identifiers: *Morone saxatilis, *Impact assessment, Biological assumptions.

In 1974 major decisions about the estimated impact of power plants along the Hudson River were reached by courts and regulatory agencies. These cases featured several striped bass (Morone saxatilis) models as tools for impact assessment. Many of the models were based on assumptions relative to distribution, transport, and behavior of early life stages of striped bass. However, data from the 1965-1968 Hudson River Fisheres Investigation, the 1969-1970 Raytheon Survey, the 1971-1972 New York University ichthyoplankton study, the 1973 Texas Instruments Hudson River Fisheries Survey, and surveys in other striped bass estuaries did not support the assumptions of most of the models. Recommendations for use of models in decision-making were offered. (Klein)
W76-03771

REPOPULATION OF AN ERADICATED STREAM SECTION BY BROOK TROUT,
Montana Fish and Game Dept., Helena.
D. E. Phinney.
Transactions of the American Fisheries Society, No 4, p 685-687, 1975. 1 tab, 4 ref.

Descriptors: *Salmonids, *Brook trout, Population, *Rotenone, Fish control agents, Propogation, Life cycles, Sampling, Habitat, *Bioindicators.
Identifiers: *Repopulation, *Electrofishing.

The rate of repopulation of a stream section treated with rotenone was studied by electrofishing. Brook trout (Salvelinus fontinalis) from the unaffected areas upstream had completely repopulated the area after one year. The primary repopulation was by young-of-the-year trout. (Klein)
W76-03772

THE EFFECT OF TANNIN ON THE MOTILITY OF WALLEYE (STIZOSTEDION VITREUM) SPERMATOZOA,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
D. L. Waltemyer.
Transactions of the American Fisheries Society, No 4, p 808-810, 1975. 1 fig, 9 ref.

Descriptors: *Fish eggs, *Fertilization, Productivity, Organic compounds, Movement, *Walleye, Water pollution effects.
Identifiers: *Tannin, Artificial propagation, Spermatozoa, Gametes, Mobility.

Tannin has been used to decrease adhesiveness of walleye (Stizostedion vitreum) eggs during artificial propagation. Spermatozoa samples were taken from ripe male walleye to investigate the effect of tannin concentrations on spermatozoa motility or fertilizing capacity. A statistically significant relationship in reduction of spermatozoa motility with increasing tannin concentrations resulted. It was recommended that tannin be withheld until the second rinse after fertilization during artificial propagation. (Klein)
W76-03773

CHLORINE-INDUCED MORTALITY IN FISH,
Minnesota Univ., Minneapolis. Dept. of Ecology and Behavioral Biology.
D. R. Grothe, and J. W. Eaton.
Transactions of the American Fisheries Society, No 4, p 800-802, 1975. 11 ref.

Descriptors: *Minnows, Fish physiology, *Toxicity, *Chlorine, *Mortality, *Fishkill, Respiration, Biochemistry, Water quality, Path of pollutants, Water pollution effects.

Identifiers: *Fathead minnows, *Pimephales promelas, Bioaccumulation, Tissue analysis, Anoxia, Nemoglobin, Methemoglobin.

Chlorine and chlorine-ammonia compounds were reported to be toxic to various species of freshwater fish. This toxicity in fathead minnows (Pimephales promelas) was found to be due to the oxidation of hemoglobin to methemoglobin which resulted in death due to anoxia. (Klein)
W76-03775

INFLUENCE OF UPPER AND LOWER TEMPERATURE EXTREMES ON THE SWIMMING PERFORMANCE OF TILAPIA MOSSAMBICA,
Madural Univ., (India). Dept. of Biological Sciences.
M. N. Kutty, and N. Sukumaran.
Transactions of the American Fisheries Society, No 4, p 755-761, 1975. 5 fig, 2 tab, 25 ref.

Descriptors: *Temperature, Swimming, Velocity, Oxygen, Heated water, Water quality, *Fish behavior, Fresh water fish, Current(Water), Fish physiology, *Thermal pollution, Water pollution effects, Tilapia.
Identifiers: *Tilapia mossambica.

Tilapia mossambica acclimated to 30C in fresh water and forced to swim at current speeds of 36, 66, and 82 cm/s in Blazka's activity apparatus failed to swim at 39.7, 38.4 and 37.0 C, respectively, when the temperature of ambient water was gradually increased from the acclimation temperature. The lower critical temperatures of swimming failure at the same swimming speeds were 17.4, 18.8 and 19.8 C, respectively. The pattern of swimming failure at the critical temperature was similar to that at critical ambient oxygen concentrations. At both upper and lower critical zones fish swam steadily again when the temperature stress was reduced. The upper avoidance temperature of T. mossambica in relatively quiet water was much lower than the upper critical temperatures of swimming failure. Since such failures did not incapacitate the fish from further performance and since the critical temperatures could be considered as points in a temperature gradient in running water, it appeared that these temperatures were indicative of a thermal avoidance in running water. (Klein)
W76-03776

THE EFFECTS OF TEMPERATURE ON THE DEVELOPMENT AND SURVIVAL OF THE EGGS AND LARVAE OF THE ATLANTIC SILVERSIDE, MENIDIA MENIDIA,
New York Ocean Science Lab., Montauk. Dept. of Fisheries Oceanography.
H. M. Austin, A. D. Sosnow, and C. R. Hickey, Jr.
Transactions of the American Fisheries Society, No 4, p 762-765, 1975. 1 fig, 2 tab, 8 ref.

Descriptors: *Silversides, *Heated water, *Growth stages, *Temperature, *Fish eggs, Embryonic growth stage, Mortality, Water quality, Powerplants, Larvae, Water pollution effects, Growth rates, New York, *Thermal pollution.
Identifiers: *Atlantic silversides, Menidia menidia, Long Island Sound(NY).

Eggs of Atlantic silverside (Menidia menidia) were fertilized and incubated at 15, 17, 20, 25 and 30C. The times to hatching at each temperature were 27.0, 12.4, 9.8, 4.8 and 3.0 days, respectively. Thermal shocks of +8C produced a 0% mortality for larvae reared at 17 and 20C, 19% for larvae reared at 25C, and 11% for larvae reared at 30C. Thermal shocks of +14C produced 3% mortality for larvae reared at 17C, 0% for larvae reared at 20C, and 100% for larvae reared at 25 and 30C. Since the larvae of M. menidia are present in the 15-20C range, it appears that the population would undergo a minimum of stress due to thermal shock as a result of nuclear power plant development at Long Island. (Klein)
W76-03777

INHIBITION OF SALT WATER SURVIVAL AND NA-K-ATPASE ELEVATION IN STEELHEAD TROUT (SALMO GAIRDNERI) BY MODERATE WATER TEMPERATURES,
Bureau of Sport Fisheries and Wildlife, Cook, Wash. Western Fish Nutrition Lab.
B. L. Adams, W. S. Zaugg, and L. R. McLain.
Transactions of the American Fisheries Society, No 4, p 766-769, 1975. 2 fig, 1 tab, 10 ref.

Descriptors: *Temperature, *Salmonids, *Trout, *Enzymes, Fish physiology, Heated water, Heat resistance, Life cycles, Growth rates, Growth rates, Growth stages, Water quality, Biochemistry, Inhibitors, Water pollution effects.
Identifiers: *Steelhead trout, *Na-K-ATPase, Tissue analysis, Parr growth stage, Smolt growth stage.

The steelhead trout metamorphosis from a freshwater parr to a sea water-tolerant smolt possessing the migration tendency was evaluated at six different growth temperatures ranging from 6 to 15C during January through July. The highest temperature where a transformation was indicated was 11.3C. By April fish reared at 6C had elevated ATPase levels typical of smolts or migratory animals and showed 92% survival in sea water. Ten and 11.3C-reared fish showed a short lived elevation in ATPase in mid-April alone concurrently with 100% sea water survival at that time. Only in 6 C-reared animals did the salt water survival ability continue into May. High ATPase levels likewise were prolonged into May and June only inthe 6C-reared group. The data indicated that metamorphosis (and therefore successful migration) of juvenile steelhead trout was directly controlled by water temperature. (Klein)
W76-03778

TOTAL POPULATION DENSITY OF CRUSTACEA AND AQUATIC INSECTA AS AN INDICATOR OF FENTHION POPULATION OF RIVER WATER,
Plant Protection Research Inst., Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W76-03779

RELATIVE IMPORTANCE OF FOOD AND WATER IN LONG-TERM ZINC-65 ACCUMULATION OF MARINE BIOTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
W. C. Renfro, S. W. Fowler, M. Heyraud, and J. LaRosa.
Journal of the Fisheries Research Board of Canada, Vol 32, No 8, p 1339-1345, August 1975. 2 fig, 3 tab, 8 ref.

Descriptors: Zinc, *Radioisotopes, *Zinc radioisotopes, Shrimp, Crabs, Fish, Analytical techniques, Path of pollutants, Metals, Water quality, *Absorption.
Identifiers: *Bioaccumulation, Tissue analysis, Zinc 65.

Shrimp, crabs, and fish were maintained for 3 months in a 65Zn-labeled simulated ecosystem in which individuals were allowed to accumulate the radiotracer either directly from the water or from a combined food and water pathway. Shrimp and crabs, receiving 65Zn from the food-water milieu, did not attain significantly higher 65Zn body burdens than those individuals that accumulated the isotope from water only. For fish, the food pathway accounted for only 2.5 times more 65Zn than that obtained after direct accumulation from water. Specific activity measurements of both organisms and water as well as comparisons of radioactive concentration factors with those based on stable element measurements indicated that 65Zn in organisms had not reached isotopic equilibrium with the isotope in the water, even though net 65Zn accumulation in shrimp and crabs had ceased by the end of the experiments. It was concluded that there are zinc pools within adult organisms that exchange only slowly, if at all, with zinc atoms available in the organisms' food or surrounding water. (Klein)
W76-03780

IDENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5A.
W76-03781

HIGH ETHYLMERCURY IN RIVER FISH BY MAN-MADE POLLUTION,
Tokyo Dental Coll. (Japan). Dept. of Hygiene.
For primary bibliographic entry see Field 5B.
W76-03782

ACCUMULATION AND APPARENT ABSENCE OF DDT METABOLISM BY MARINE COPEPODS, CALANUS SPP. IN CULTURE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
D. C. Darrow, and G. C. H. Harding.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10 p 1845-1849, 1975. 2 tab, 5 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Copepods, Equilibrium, Plankton, Path of pollutants, Toxicity, Radioisotopes, Metabolism, *Absorption.
Identifiers: *Calanus spp., Tissue Analysis, Bioaccumulation.

14C-p, p'-DDT was taken up from sea water by nonfeeding marine copepods held at 6C for 3 weeks. Calanus spp. reached an equilibrium DDT level of 50-100 ppm (dry weight) after 3-4 weeks exposure in an initial water concentration of about 450 pptr. No metabolites of p,p'-DDT could be detected during this period. (Klein)
W76-03784

HERITABLE RESISTANCE TO GAS BUBBLE DISEASE IN FALL CHINOOK SALMON, ONCORHYNCHUS TSHAWYTSCHA,
Oregon Wildlife Commission, Gold Beach.
S. P. Cramer, and J. D. McIntyre.
Fishery Bulletin, Vol 73, No 4, p 934-938, 1975. 1 tab, 8 ref.

Descriptors: *Salmonids, *Fish diseases, *Genetics, *Chinook salmon, *Resistance, Evolution, Gases, Oyxgen, Fish genetics, Columbia River, Dams, Mortality, Fish stocking, Water pollution effects.
Identifiers: Heritability, *Gas bubble disease.

Differences between fall chinook salmon Oncorhynchus tshawytscha) stocks indicated that selection for phenotypes with greatest resistance to gas bubble disease has occurred in the Columbia River, an area of active dam construction. This conclusion was supported by the observation that stocks with the longest histories of exposure to super-saturated water were most resistant to gas bubble disease. The low heritability for resistance to gas bubble disease indicated that no great increases in resistance can be expected even at relatively high selection intensities. Stocks transferred from coastal streams to hatcheries within the Columbia River drainage may experience high levels of mortality from gas bubble disease. Columbia River stocks may provide a source of brood fish that are resistant to the disease for stocking in other waterways. (Klein)
W76-03785

FFECTS OF TEMPERATURE ON OIL REFINERY WASTE TOXICITY,
Jtah State Univ., Logan. Dept. of Civil and Environmental Engineering.
. H. Reynolds, E. J. Middlebrooks, D. B. Porcella, and W. J. Grenney.
ournal Water Pollution Control Federation, Vol 7, No 11, p 2674-2693, 1975. 2 fig, 15 tab, 73 ref. WRT B-070-UTAH (8).

escriptors: Methodology, *Oil waste, **Thermal ollution, *Chlorophyta, Mathematical models, hibition, Enzymes, Biochemistry, Model stues, Oil wastes, Water quality, Algae, Industrial astes, Temperature, *Toxicity, Phenols, Water llution effects.
dentifiers: Selenastrum capricornutum, Oil finery wastes.

continuous flow kinetic model was developed to scribe phenol toxicity to the green alga Selenasum capricornutum and to predict the effects of mperature on the toxicity of a specific oil finery waste. The model was based on ichaelis-Menten enzyme inhibition kinetics, with monium nitrogen limited, continuous flow algal ltures grown between 20 and 28C. Phenol was e controlling inhibitor. The model was applied to ntinuous flow algal cultures exposed to an acal oil refinery waste. The phenol and oil refinery aste exerted competitive inhibition of Selenasm capricornutum. Phenol was more toxic at 24C an at either 20 or 28C. The oil refinery waste was proximately 10 times more toxic than pure enol to Selenastrum capricornutum. (Klein)
76-03786

STON COMPOSITION IN THE POINT LEE AREA OF LAKE ERIE,
ke Erie Fisheries Research Station, Wheatley ntario).
H. Leach.
ernational Revue der Gesamten Hydrobiologie, 160, No 3, p 347-357, 1975. 3 fig, 6 tab, 35 ref.

scriptors: *Detritus, Sediments, *Algae, *Lake iments, *Seston, Seasonal, *Regression analy-, *Carbon, *Decomposing Organic Matter, eat Lakes, Sediment load, Suspended solids, oplankton, Phytoplankton, Analytical hniques, Methodology, *Lake Erie.
ntifiers: Pigments, Particulate organic carbon.

sonal variation in several components of oric seston in two areas of Lake Erie are cribed. Estimates from regression analysis inte that about one-third of organic matter was g algae; the remainder was detritus. The ount of detrital carbon was least in summer and ximal in autumn. This distribution was related sediment resuspension and rate of organic ter decomposition. Major sources of detritus e considered to be allochthonous organic ter, particularly municipal and industrial tes, and resuspended sediments. (Katz)
6-03787

OBLEM OF MERCURIALISM IN CONNECN WITH MERCURY POLLUTION OF THE VIRONMENT, (IN RUSSIAN),
primary bibliographic entry see Field 5B.
6-03796

ANGES OF THE GROUNDWATER SUPPLY NDITIONS IN CONNECTION WITH CONUCTION OF RESERVOIRS (BASED ON EXIENCE OF THE GORKI RESERVOIR, (IN SIAN),
kovskii Meditsinskii Institut (USSR).
. Yurasova.
Sanit. 8. 88-89. 1974.

criptors: *Groundwater, *Water supply, ic health, *Reservoir construction, Impoundts, Water pollution effects, Rivers.
Identifiers: *Gorki Reservoir(USSR), Russian-SFSR, USSR, Volga, River.

The hygienic effect of streamflow control on groundwater supply conditions was evaluated. Measures for its improvement were developed, based on experience of long-term observations of the Gorki reservoir on the Volga River (Russian SFSR, USSR)--Copyright 1975, Biological Abstracts, Inc.
W76-03804

EPIDEMIOLOGY OF SALMONELLAE AND FERTILIZING OF GRASSLAND WITH SEWAGE SLUDGE (SALMONELLENEPIDEMIOLOGIE UND GRUENLANDDUENGUNG MIT KLAERSCHLAMM),
E. Hess, and C. Breer.
Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, I. Abteilung Originale Reihe B, Vol. 161, No. 1, p 54-60, 1975. 1 fig, 2 tab, 11 ref.

Descriptors: *Water pollution effects, Epidemiology, *Waste water treatment, *Sludge treatment, *Salmonella, Disinfection, Sludge disposal, Anaerobic digestion, Fertilization, Irradiation, Gamma rays.
Identifiers: Pasteurization.

Research conducted identified Salmonellae in more than 90% of sewage sludge samples collected. The maximum number of organisms found was 10,000,000/liter. Neither aerobic stabilization nor anaerobic digestion significantly reduced the Salmonellae contamination. Salmonellae in sewage sludge applied to grasslands can survive up to 72 weeks. Therefore, fertilizing with non-disinfected sludge may lead to transmission from plant to animal. There is an increasing number of Salmonella carriers among herds of cattle demonstrating that transmission is occurring and is a growing danger. The disinfection of sludge to be used as fertilizer is now a necessity. The disinfecting effect of pasteurization and of gamma irradiation on sewage sludge was investigated. Proper pasteurization in 5 plants (70 C for 30 min) resulted in 98-100% of the tested sludge samples containing less than 10 Enterobacteriaceae per gram. Application of 300 krad resulted in 97.2% of the samples containing less than 10 Enterobacteriaceae per gram. (Orr-FIRL)
W76-03807

STUDIES ON PREVENTION OF WATER POLLUTION. IV. EFFECT OF SYNTHETIC DETERGENTS ON WASTE PURIFICATION WITH ACTIVATED SLUDGE PROCESS (SUISHITSU ODAKU BOSHI NI KANSURU KENKYU (DAI PO). HAISUI NO KASSEIODEI SHORI NI OKERU GOSEI SENZAI NO EIKYO NI TSUITE),
Tohoku Coll. of Pharmacy, Sendai (Japan).
O. Sakaguchi, Y. Yokota, and S. Takashita.
Eisei Kagaku, (The Journal of Hygienic Chemistry), Vol 21, No 4, p 194-198, 1975. 5 tab, 19 ref.

Descriptors: *Detergents, *Sewage treatment, *Activated sludge, *Alkylbenzene sulfonate, Linear alkylate sulfonates, Water pollution, Biodegradation, Aeration.

The effects of synthetic or commercial detergents on the efficacy of the activated sludge process was studied. Difficulties were observed in purifying sewage containing linear alkylbenzene sulfonate (LAS), which remained in the alkaline range (pH 8.2). While 10 ppm of LAS did not affect the purification of sewage by activated sludge, the addition of over 50 ppm LAS inhibited removal rates of both proteins and the detergent. The biodegradation of LAS was found to be inhibited by nutrients added in the sewage, but higher fatty acid sulfate showed a high degree of detergent removal from the sewage. In the case of commercial synthetic detergents, about 90% were degraded. For these, the presence of nutrients increased the amount of residual detergent in the supernatant after aeration. It was also seen that TTC reduction of substrates with activated sludge was slightly inhibited by the addition of LAS in the reaction medium. (See also W75-12316) (Kramer-FIRL)
W76-03820

SUMMARY OF HYDROLOGIC CONDITIONS AND EFFECTS OF WALT DISNEY WORLD DEVELOPMENT IN THE REEDY CREEK IMPROVEMENT DISTRICT, 1966-73,
Geological Survey, Winter Park, Fla.
For primary bibliographic entry see Field 4C.
W76-03908

SANITARY SIGNIFICANCE OF SOME DISCOVERIES IN THE BIOLOGY OF WATER MICROFLORA, (IN RUSSIAN),
E. I. Demikhovskii.
Gig Sanit. 11. 63-66. 1974.

Descriptors: *Algae, *Bacteria, *Cyanophyta, Reviews, Gases, Self purification, Pseudomonas.
Identifiers: *Autochthonous bacteria, Beggiatoales, Chlamydobacteriales, Chroococcales, Eubacteriales, Nostocales, Pseudomonadales, *Gas vacuoles.

The literature on the significance of gas vacuoles for the biology of blue-green algae and autochthonous aquatic bacteria is reviewed. The collapse and formation of gas vacuoles lead to marked change in the specific weight of the host cells and thereby enable them to descend to the necessary depth or rise to the surface of waters. The gas vacuoles play an important role in processes of natural self-purification of waters. Further study will reveal new conditions affecting links of the cycle of matter in waters and consequently the sanitary state of the waters. Chroococcales, Nostocales, Pseudomonadales, Chlamydobacteriales, Eubacteriales and Beggiatoales are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-03964

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.
For primary bibliographic entry see Field 4D.
W76-03965

SEDIMENT TRANSPORT FROM BIG SAGEBRUSH WATERSHEDS,
Forest Service (USDA), Laramie, Wyo. Forest Range and Watershed Lab.
For primary bibliographic entry see Field 4D.
W76-03966

5D. Waste Treatment Processes

RAPID SETTLER APPARATUS,
M. J. Bebech.
U S Patent No 3,919,084, 6 p, 10 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 890-891, November 11, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, Settling basins, Separation techniques, Liquid wastes, Solid wastes, Sludge treatment, Equipment.

A solid settler apparatus for liquid-solid mixtures of various types comprise a number of abutted flat separator modules each including vertically spaced separator chambers. Each separator chamber has downward and inward inclined settler trays. A center solids collecting zone and a bottom

solids discharge outlet is included. The flow of the liquid-solid mixture is through a conduit upward from one chamber to the adjacent vertically above chamber for series flow of the solid-liquid mixture through the settler modules. Collectors and distributors connect to the modules at the outlets. Alternate compaction means connect to the collector and distributor for receiving thickened liquid-solid mix and further separating the liquids and discharge of the compacted solids. (Sinha-OEIS)
W76-03509

SEWAGE TREATMENT APPARATUS,
NUS Corp., Rockville, Md. (Assignee).
D. F. Peck, and J. C. Troy.
U S Patent No 3,919,086, 5 p, 7 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 892, November 11, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Organic wastes, *Activated sludge, Aeration, Biological treatment, Flocculation, Water pollution control, Separation techniques, Septic tanks, Equipment.
Identifiers: Imhoff tanks.

An Imhoff tank is converted into an activated sludge facility. The conversion is accomplished by relocating the feed from its normal position in the center settling compartment to one of the gas vent slots along the side of the Imhoff tank. Air sparges are installed along the bottom of both sides of the large bottom digestion compartment, and a simple air-lift pump is installed having its suction end at the very bottom of the inverted pyramid of the digestion chamber with its discharge into the gas vent area at the top of the tank near where the influent feed enters the device. Since the feed enters the outer compartment through the vents, its must flow upward through the slot in the bottom of the settling chamber to reach the exit. In flowing upward through this narrow slot, the aerated feed stock carries some floc with it due to its velocity. However, as the settling chamber widens, the velocity slows and the suspended particles come to an equilibrium position forming a fluidized sludge bed through which the water must rise. This fluidized bed functions as a strainer and tends to filter out and agglomerate the finer particles resulting in water of exceptional clarity. (Sinha-OEIS)
W76-03510

CONTINUOUS PRESSURE FILTERING AND/OR SCREENING APPARATUS FOR THE SEPARATION OF LIQUIDS AND SOLIDS,
Secondary Processing Systems, Warren, Pa. (Assignee).
I. S. Brumagin.
U S Patent No 3,919,087, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 892, November 11, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, Solid wastes, *Filtration, Filters, *Separation techniques, Hydraulic systems, Equipment, Liquid effluent.
Identifiers: Filter cake.

The solids-liquid slurry is pumped by means of apump capable of developing up to several hundred pounds of hydraulic pressure into a jacketed cylinder, the inner shell of which is a screen-filter complex designed to withstand the hydraulic pressure. A screw of a diameter to turn closely within the complex removes the solids built up and moves them toward the discharge end of the cylinder. The outside diameter of the screw versus the inside diameter of the filter complex determines the depth of filter cake permitted to accumulate on the filter complex. The liquid is forced by the hydraulic pressure through the accumulated solids and the screen and/or filter complex into the jacket from which it is piped for further processing. (Sinha-OEIS)
W76-03511

SURFACE SKIMMING SYSTEM,
Ecodyne Corp., Lincolnshire, Ill. (Assignee).
R. L. Shaffer.
U S Patent No 3,919,090, 4 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 873, November 11, 1975.

Descriptors: *Patents, *Waste water treatment, *Domestic waste, Industrial wastes, Water pollution control, Separation techniques, Equipment, Scum, *Skimming.

A sewage or industrial waste treatment system has a clarified tank as one stage in the operation. As solids separate from effluent by settling, very light solids tend to float and form a scum on the surface. A surface skimmer is provided which includes a rotating skimming arm, a scum blade and pocket assembly, and a scum baffle. The skimming arm sweeps the surface of the clarifier pushing the floating matter ahead of it. The scum blade and pocket assembly is secured to the outer end of the skimming arm for receiving and directing the outwardly moving floating matter into the scum baffle. The scum baffle is located adjacent the outer periphery of the clarifier tank and includes a scum beach and trough assembly to receive the floating matter collected in the scum pocket. A pair of scum blades are positioned adjacent one another in an overlapping relationship and are independently biased agains the side walls of the scum baffle by flexible support members. The flexible support members are in turn secured to the skimmer arm through a torsion bar so as to permit vertical movement of the scum blades while maintaining a downward bias as they move along the scum beach. (Sinha-OEIS)
W76-03512

PROCESS AND INSTALLATION FOR THE TREATMENT OF WATER AND OTHER LIQUIDS,
Abwassertechnik und Kunst stoffbau GmbH, Waiblingen (East Germany). (Assignee).
For primary bibliographic entry see Field 3A.
W76-03515

ION EXCHANGE OF METALS FROM AQUEOUS SOLUTIONS,
Marathon Oil Co., Findlay, Ohio. (Assignee).
P. A. Argabright, L. M. Echelberger, and B. L. Phillips.
U S Patent No 3,920,545, 5 p, 5 ref; Official Gazette of the United States Patent Office, Vol 940, No 3, p 1368, November 18, 1975.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Water purification, Water pollution control, *Metals, *Ion exchange, Mercury, Lead, Chemical reactions, Resins, Aqueous solutions.
Identifiers: Polyisocyanurate salts, Barium.

Metals can be removed from aqueous solutions by contacting such solutions with a composition formed by reacting polyisocyanurate salts with synthetic resins. The resulting composition contains polyisocyanurate salt groups which act as exchange sites for removing the metals from solution. Regeneration by treatment with suitable inorganic metal salts and use of chloromethylated synthetic resins in the forming of the polymer are utilized. The invention is useful for the removal of metals from a wide variety of aqueous solutions including industrial and commercial effluents, for purification of process streams, thereby preventing precipitation on internal screens or filters; for removal of deleterious metals from ingestible liquids, e.g., drinking water; for removal of metals where they could react with commercial products e.g., as in catalyst production or in hydrocarbon conversion processes. (Sinha-OEIS)
W76-03516

METHOD OF DESTROYING CYANIDES,
Houston Research, Inc., Tex. (Assignee).
R. L. Garrison, H. W. Prengle, Jr., and C. E. Mauk.
U S Patent No 3,920,547, 7 p, 1 fig, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 940, No 3, p 1369, November 18, 1975.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Water pollution treatment, Water pollution control, Ozone, Ultraviolet radiation, Iron.
Identifiers: *Cyanides, Water pollution prevention.

The Method allows for the effective utilization of ozone in the destruction of cyanides, specifically cyanides complexed with iron. This destruction of such cyanides in an aqueous cyanide solution is provided by contacting an aqueous solution of cyanides with an ozone-containing gas and simultaneous irradiating the aqueous cyanide solution with ultraviolet light. The contact of the aqueous solution of cyanides and ozone-containing gas is carried out while maintaining the pH of the aqueous solution of cyanides within the range of 5-9. In addition, the reactivity of the system can be enhanced by heating the solution to a temperature of from about 30 deg to about 70 deg C. during the contact with the ozone-containing gas. The method is carried out by contacting the aqueous cyanide solution and ozone-containing gas in a plurality of separate contact zones, countercurrent or with parallel flow, with the simultaneous radiation with ultraviolet light being carried out at least one of the separate contact zones, preferably, at least in the last zone of contact when the cyanide ion concentration is a minimum and the reaction rate must be enhanced. (Sinha-OEIS)
W76-03517

WET OXIDATION PROCESS FOR WASTE MATERIAL,
Barber-Colman Co., Rockford, Ill. (Assignee).
W. M. Fassell, and D. W. Bridges.
U S Patent No 3,920,548, 9 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 940, No 3, p 1370, November 18, 1975.

Descriptors: *Patents, *Waste treatment, *Sewage treatment, *Oxidation, Waste disposal, Liquid waste, Waste water disposal, Treatment facilities.
Identifiers: *Wet oxidation.

The wet oxidation of carbonaceous waste materials with an oxidizing gas is effected in a horizontally-elongated reactor vessel divided into generally cylindrical, interconnecting, compartments. An aqueous dispersion of the wastes is continuously introduced into a compartment at one end of the reactor vessel, and flows from compartment to compartment while an oxidation gas is continuously introduced into each compartment. The dispersion is vigorously agitated to disperse the oxidizing gas, and thereby effect oxidation of the waste materials to produce an ecologically acceptable effluent. The average temperature of the dispersion is maintained at a low level, and the pH is held in the acid range. (Sinha-OEIS)
W76-03518

SELF-CONTAINED WATER TREATMENT SYSTEM,
For primary bibliographic entry see Field 5F.
W76-03519

DEALING WITH OIL SPILLAGE CONTAMINATION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W76-03522

TERFACE OF ELECTROCHEMICAL AND ONVENTIONAL METHODS FOR POLLUON CONTROL,
cific Engineering and Production Co. of evada, Henderson.
C. Rhees.
Electrochemical Contribution to Environmen- Protection, Thedore R. Beck, et al., editors. e Electrochemical Society, Inc., Princeton, w Jersey, 1972, p 147-158. 7 fig, 4 plates, 1 ref.

scriptors: *Electrochemistry, *Waste water atment, *Electrolytes, *Equipment, Industrial stes, Anodes, Cathodes, Gases, Sewage treatnt, Effluents, Odor, Disinfection.
ntifiers: *Electrolytic systems, Hypochlorite oduction.

e efficiency and cost benefits of the PEPCON cific Engineering and Production Company- vada) electrolytic waste treatment system for nestic and industrial wastes is described. Comrcial systems are available largely for disinfecn of sewage plant effluents, bacterial control in ustrial waste streams, and for odor control to id and gaseous effluents. The basic unit of the tem consists of a metal tube, which serves as cathode and container, mounted on and supted by the cathode bus. The anode is a graphite electroplated with a dense, hard, impervious d dioxide coating. The anode is inserted into the al tubing and sealed in place with non-conductsupports and spacers. The graphite rod pros above the anode-cathode assembly and is trically connected to the anode bus. The liquid te or brine stream is pumped through the cell; cells are grouped into modules. Interfacing the trochemical treatment with municipal waste tment systems can occur at lift stations in the age collection network, at the headworks of plant, on the supernatant streams from the erobic digestors, for disinfection of the efnt, and for overtreatment of effluent water for e. Various installations are described includone being developed for a shipboard treatment t. (Auen-Wisconsin)
5-03532

ROUS CATHODE CELL FOR METALS MOVAL FROM AQUEOUS SOLUTIONS,
Industries, Inc., New Martinsville, W. Va. rium Technical Center.
. Carlson, and E. E. Estep.
Electrochemical Contribution to Environmen- Protection, Theodore R. Beck, et al., editors. Electrochemical Society, Inc., Princeton, Jersey, 1972, p 159-166. 5 fig, 2 tab.

criptors: *Electrochemistry, *Waste water ment, *Cathodes, *Cation adsorption, tals, Anodes, Iron, Lead, Nickel, Electes, Brines, Electrolysis, Ions, Copper, Pilot ts, Mercury.
tifiers: Diaphragm cell, Caustic soda purifica-

pgrade diaphragm cell caustic soda quality, Industries, Inc., of West Virginia, developed ectrolytic method to remove metallic impuriiron, nickel, and lead) from caustic solutions. tions were pumped through a porous carbon raphite cathode electrolytic cell where metal were reduced and deposited. Commercially ell has improved product quality and lowered . The cell removes low metal concentrations aqueous solutions to improve quality, clean ent streams, or recover metal. When the cell used commercially for diaphragm cell caustic purification, iron, lead, calcium oxide, and esium oxide were reduced; the product ined permanently clear. With the anode stream, lead and copper were deposited first, l throughout, and iron nearest the anode. the anode upstream, iron was first followed pper, lead, and nickel. During pilot plant val of mercury from brine and waste streams, pervious graphite anode was used. Feed solution should be acidified, dechlorinated, and filtered. Downstream anodes minimized chlorine contact with mercury in the cathode and permitted better mercury removal. The cathode can be regenerated. Other metal and electrolyte systems should be amenable to processing in this cell, depending on metal ion nature and concentration, solution colume, and costs. (Buchanan-Davidson--Wisconsin)
W76-03533

THE BASIC ELECTRIC CELL IN EFFLUENT TREATMENT,
Swift and Co., Oak Brook, Ill. Research and Development Center.
E. C. Beck, and A. P. Giannini.
In: Electrochemical Contribution to Environmental Protection, Theodore R. Beck, et al., editors. The Electrochemical Society, Inc., Princeton, New Jersey, 1972, p 167-170.

Descriptors: *Waste water treatment, *Electric currents, *Emulsions, *Industries, Hydrogen ion concentration, Dissolved oxygen, Biochemical oxygen demand, Flotation, Suspended solids, Corrosion.
Identifiers: *Impressed current systems, Electric cells.

Effectiveness of standard equipment in effluent treatment can be increased on plant effluent streams by creating a three dimensional anolyte stream in the equipment. Field studies of impressed current effects on waste treatment show that anode pH may be 4 units lower than influent pH. At the cathode, pH increases. Most emulsions are broken by mineral acids or the anionic action of the impressed current system. Depending on current density, dissolved oxygen can increase 300% the value obtained by passing air through the solution. Impressed current can dissipate biochemical oxygen demand, assist in suspended particle flotation, convert sulfide to thiosulfate, help remove suspended particles, and protect equipment from corrosion. On passing through an electric field, effluents seem more susceptible to chemical treatment and test results are enhanced. With efficient equipment, ponds and long treatments are eliminated. Electric cell action is rapid thus large volumes of waste can be handled. In a field test with a single treatment and skim tank coupled with moderate chemical treatment, 90% of the biochemical oxygen demand, 98% of the grease, and 92% of the suspended solids were removed. The operation is successful in edible oil refineries, packing plants, and rendering facilities. (Buchanan-Davidson--Wisconsin)
W76-03534

WASTEWATER USE IN THE PRODUCTION OF FOOD AND FIBER--PROCEEDINGS.
Robert S. Kerr Water Research Center, Ada, Okla.
Environmental Protection Agency, Report EPA-660/2-74-041, June 1974, 568 p.

Descriptors: *Aquaculture, *Irrigation practices, *Waste water treatment, *Crop production, *Conferences, Research facilities, Thermal water, Daphnia, Catfishes, Forage grasses, Fiber crops, Trees, Salmon, Public health, Water law, Water hyacinth.
Identifiers: *Fish culture, *Aquatic plant culture.

An interdisciplinary group of about 200 persons met to review the present base of scientific knowledge relating to benefits and constraints of using wastewaters for production of food and fiber. There were 27 papers presented by representatives from the fields of public health, engineering, agriculture, aquaculture, and other related scientific disciplines. Papers in two sections on potential restraints cover topics such as historical instances of disease transmission, possible transport of microbial pathogens through the food chain, legal implications, and sociological reactions. The aquaculture section deals primarily with experiment studies including such diverse approaches as culture of adaphnia, salmon smolts, and water hyacinth. The agriculture section emphasizes the use of wastewater for crop production and the papers presented include case histories for long-term operating systems, as well as data from experimental studies. In addition to those papers presented at the conference, nine others have been included to make a total of 36 papers in the conference proceedings. (See W76-03542 thru W76-03576) (Thomas-EPA)
W76-03541

REVIEW OF AMERICAN PUBLIC WORKS ASSOCIATION STUDY OF FACILITIES UTILIZING LAND APPLICATION OF WASTEWATER,
American Public Works Association, Chicago, Ill.
R. H. Sullivan.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 2-8. 1 ref, 4 tab.

Descriptors: *Waste water disposal, *Irrigation water, Publications, Reviews, Waste water treatment, Water pollution control, Water pollution treatment, Surveys, Treatment facilities, Legislation, Crops, Forests, On-site investigation, Foreign countries, Waste disposal, Soil disposal fields, Regulation, Irrigation, Irrigation effects.

This article reviews some of the findings of an American Public Works Association study of effluent treatment facilities in the U.S.A. practicing land disposal of waste waters. The data were obtained by on-site visits to approximately 100 plants and questionnaires to many more not visited. The nature and extent of state health and water pollution control regulations governing the use and control of land application systems are covered, and experience with land disposal of waste waters in foreign countries are cited. Although facilities of all types (industrial and municipal) were surveyed, the report is primarily concerned with irrigation-type facilities for supplying supplemental water to crop and forest areas and unharvested soil cover acreages. The report, titled Survey of Facilities Using Land Application of Wastewater, is available from the Government Printing Office (Washington, D.C.) as EPA-430/9-73-006 at a price of $6.80. (See also W76-03541) (Witt-IPC)
W76-03542

WASTEWATER UTILIZATION IN INTEGRATED AQUACULTURE AND AGRICULTURE SYSTEMS,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
B. Hepher, and G. L. Schroeder.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 9-15. 1 fig, 7 ref.

Descriptors: *Waste water(Pollution), *Water reuse, *Irrigation water, *Aquiculture, Agriculture, Water pollution sources, Water pollution treatment, Dissolved oxygen, Toxins, Irrigation, Fish farming, Irrigation.

Limitations restricting the reuse of waste water for irrigation purposes are outlined, and it is suggested that the solution to overcoming these problems lies in a system which integrates waste treatment with aquaculture and agriculture. The result is a flow of waste from the treatment plant through fish ponds to irrigated fields. The benefits of fish ponds in waste water treatment and the improvement in waste water by ponds are discussed. Problems associated with this method of treatment (such as maintaining and adequate dissolved oxygen concentration and the effects of toxic substances) are also discussed. (See also W76-03541) (Witt-IPC)
W76-03543

DISEASES TRANSMITTED BY FOODS CONTAMINATED BY WASTE WATER,
Center for Disease Control, Atlanta, Ga.
For primary bibliographic entry see Field 5C.
W76-03544

THE EVALUATION OF MICROBIAL PATHOGENS IN SEWAGE AND SEWAGE-GROWN FISH,
Oklahoma State Dept. of Health, Oklahoma City.
For primary bibliographic entry see Field 5C.
W76-03545

MORBIDITY RISK FACTORS FROM SPRAY IRRIGATION WITH TREATED WASTE WATERS,
Texas Univ., Houston. School of Public Health
For primary bibliographic entry see Field 5C.
W76-03546

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. I. MONITORING DURING PILOT OPERATION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-03547

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. II. DEVELOPMENT OF GUIDELINES BY METHOD OF ADDITIONS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-03548

CALCULATED YIELD OF SEWAGE LAGOON BIOMASS, A PLAN FOR PRODUCTION, AND SOME OF THE PROBLEMS INHERENT IN USING BIOMASS OR LAGOON WATER FOR PRODUCTION OF FOOD AND FIBER,
Bowling Green State Univ., Ohio. Dept. of Biology.
K. Schurr, and J. M. Golombek.
In: Wastewater Use in the Production of Food and Fiber - Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 102-109. 18 ref.

Descriptors: *Biomass, *Sewage lagoons, *Productivity, Algae, Sewage treatment, Lagoons, Waste water treatment, Harvesting, Harvesting of algae, Feeds, Soil amendments, Water pollution treatment, Water pollution control, Ohio, Aerated lagoons, Toxicity, Pathogenic bacteria, Byproducts.
Identifiers: Methanol(Methyl alcohol).

Lagoon sewage treatment produces, in addition to the water, a huge volume of plant and animal biomass. A single crop for the terminal aerobic lagoon at the Deshler, Ohio, waste water treatment plant yields 1596 cu m of dry biomass per hectare. Removal of the floating material could increase the yield to over 2000 cu m per hectare. Proposed methods of harvesting the biomass are given and uses are suggested, including as a component in domestic animal feeds, to generate methanol, and as a soil conditioner. Problems associated with the use of the biomass material, such as contamination by toxic substances or pathogenic bacteria, are discussed. (See also W76-03541) (Witt-IPC)
W76-03549

ANALYSIS OF SEWAGE LAGOON BIOMASS WATER SOLUBLE VITAMINS BY MICROBIOLOGICAL TECHNIQUES,
Findlay Coll., Ohio. Div. of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-03550

FEED AND FIBER FROM EFFLUENT-GROWN WATER HYACINTH,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
L. O. Bagnall, T. deS. Furman, J. F. Hentges, Jr., W. J. Nolan, and R. L. Shirley.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 116-141. 7 fig, 26 ref, 7 tab.

Descriptors: *Water hyacinth, *Feeds, *Fiber crops, **Sewage effluents, Nutrients, Phosphorus compounds, Nitrogen compounds, Sheep, Cattle, Ruminants, Livestock, Bermudagrass, Water pollution control, Water pollution treatment, Water pollution sources, Waste water treatment, Sewage, Pulp and paper industry, Byproducts, Sewage treatment, Effluents.
Identifiers: Eichhornia crassipes, Paper, Compost, Papermaking fibers.

Water hyacinth (Eichhornia crassipes) was used to remove nutrients, primarily nitrogen and phosphorus, from secondary treated sewage effluent; some of the plants were subsequently ensiled or dried and fed to sheep and cattle and some were pulped to make paper. The irregularly harvested pond removed 10% of the nitrogen and phosphorus from the effluent, only 10% of which could be accounted for in the plant tissues. Cattle and sheep readily ate processed water hyacinth in complete diest and remained in good health, but did not utilize the nutrients as well as nutrients in a land forage, coastal Bermuda grass. The primary feeding value is as sources of energy, mineral elements and roughage for ruminants. Paper can be made from water hyacinth but yield and pulp freeness are low, making production uneconomical. The paper has good breaking and bursting strength but low tearing strength. Compost may be the best use, having the highest value and lowest processing cost. (See also W76-03541) (Witt-IPC)
W76-03551

THE AVAILABILITY OF DAPHNIA FOR WATER QYALITY IMPROVEMENT AND AS AN ANIMAL FOOD SOURCE,
Texas State Dept of Health, Austin. Div of Wastewater Technology and Surveillance.
R. Dinges.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 142-161. 8 fig, 18 ref.

Descriptors: *Daphnia, *Waste water treatment, *Biological treatment, Waste treatment, Water pollution treatment, Water pollution control, Crustaceans, Aquatic animals, Algae, Bacteria, Protozoa, Oxidation lagoons, Hydrogen ion concentration, Photoperiodism, Light, Water temperature, Depth, Sulfides, Mixing, Marketing, Fish food organisms, Proteins, Feeds, Byproducts.

The incorporation of advanced biological methods into waste water treatment systems to make use of fertile effluents forcvultivation of beneficial organisms appears feasible. The use of Daphnia to attain improvement of waste water is discussed. Daphnia are common aquatic crustaceans about 1.8-inch long which feed upon algae, bacteria, Protozoa, and debris. Environmental factors affecting the growth of Daphnia in stabilization ponds are discussed, including light (photoperiod) and water temperature, depth, pH, and mineral content. Daphnia culture in waste waters requires pH control within a range of 7.0-7.5 and sufficient mixing for suppression of soluble sulfides. Equipment exists for harvesting Daphnia. The present market for Daphnia is limited to fish food, but an excellent use would be as a protein additive in animal feeds. The clarified effluent is suitable for biological treatment or chemical-physical methods for further nutrient removal. (See also W76-03541) (Witt-IPC)
W76-03552

REPORT ON PILOT AQUACULTURE SYSTEM USING DOMESTIC WASTEWATERS FOR REARING PACIFIC SALMON SMOLTS,
Humboldt State Univ., Arcata, Calif. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W76-03553

AQUACULTURE AS A MEANS TO ACHIEVE EFFLUENT STANDARDS,
Oklahoma State Dept. of Health, Oklahoma City. Water Quality Monitoring and Research Div.
M. S. Coleman, J. P. Henderson, H. G. Chicheste and R. L. Carpenter.
In: Wastewater Use in the Production of Food a Fiber -- Proceedings, March 5-7, 1974, Oklahom City, Oklahoma, p 199-214. 5 fig, 15 ref, 2 tab.

Descriptors: *Sewage lagoons, *Sewage effluent *Fish stocking, *Aquiculture, Water pollut sources, Water pollution treatment, Water pol tion control, Oklahoma, Domestic wast Aerated lagoons, Ammonia, Nitrog Phosphorus, Costs, Income, Waste water tre ment, Lagoons, Aquatic animals, Water polluti effects, Water quality, Stocking, *Water qua standards, Standards, Effluents
Identifiers: Quail Creek Sewage Lagoon(Okla).

Preliminary studies by the Oklahoma State D partment of Health showed that the quality of fluents from a waste water lagoon can be proved by stocking the lagoon with fish. The st was carried out at the Quail Creek Sewage Lag system (located near Oklahoma City, Oklaho receiving approximately 750,000 gal/day of domestic sewage. The lagoon consists of 2 aera and 4 nonaerated cells, operated serially. monia was reduced below 1.0 mg/liter N in fluent from the first cell. Of the total N remai in the system, the majority from the third thro sixth cells was organic nitrogen. Phosph showed good reduction throughout the system low of 2.39 mg/liter in the final effluent. Estim costs and income from an advanced biolo treatment system are given. (See also W76-03 (Witt-IPC)
W76-03554

AN EXPERIMENT IN THE EUTROPHICAT OF TERRESTRIAL ECOSYSTEMS W SEWAGE: EVIDENCE OF NITRIFICATIO A LATE SUCCESSIONAL FOREST.
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 5C.
W76-03555

IRRIGATION WITH WASTEWATER BAKERSFIELD, CALIFORNIA,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 3C.
W76-03556

NUTRITIVE VALUE OF AEROBIC TREATED LIVESTOCK AND MUNIC WASTES,
Illinois Univ. at Urbana-Champaign. Co Agriculture; and Illinois Univ. at Urbana- paign. Coll. of Engineering.
D. L. Day, and B. G. Harmon.
In: Wastewater Use in the Production of Fo Fiber -- Proceedings, March 5-7, 1974, Okl City, Oklahoma, p 240-252. 3 fig, 27 ref, 11

Descriptors: *Municipal wastes, *Farm *Nutrients, *Feeds, *Aerobic treatment, pollution sources, Waste treatment, Pr Economics, Oxidation, Illinois, Amino Costs, Water pollution treatment, Sewag ment, Byproducts, Potable water.
Identifiers: Lysine.

This report reviews some major studies an the amino acid content of aerobically

wage and livestock wastes and evaluating the oduct as a protein supplement in the diets of estock. A method developed at the University Illinois utilizes oxidation-ditch mixed liquor DML) in situ, supplying drinking water as well protein and other nutrients. Crude protein in the ML varies from 30 to 46%, the latter value is as h as in soybean meal. Also, lysine and other ino acids essential to growth can be as high in centrated ODML as in soybean meal. This thod avoids the ordinary expenses generally as- iated with recycling and minimizes pollution. present costs of soybean meal make the thod economically feasible and energetically at- tive. However, a more efficient method of ox- ion is needed. Even so, the aerobic process of- possibilities for an inexpensive method of te management. (See also W76-03541) (Witt-)
6-03557

ASS FILTRATION FOR FINAL TREAT- NT OF WASTEWATER,
nsylvania State Univ., University Park.
1. Butler, J. V. Husted, and J. N. Walter.
Wastewater Use in the Production of Food and r -- Proceedings, March 5-7, 1974, Oklahoma , Oklahoma, p 256-272. 1 fig, 9 ref, 9 tab.

criptors: *Grassland, *Waste water treatment, tration, *Soil filters, Nitrates, Phosphates, In- nic compounds, Phosphorus compounds, ogen compounds, Sewage effluents, On-site stigations, Water pollution sources, Water tion treatment, Waste treatment, Laboratory , Recycling, Waste treatment, Vegetation, off.

ass filtration systems, waste water is applied the top of a sloping site and flows through oil-plant filter with subsequent runoff. The val of nitrate and phosphate from secondary ed municipal sewage effluent by a grass filtra- system was studied. The results of field stu- indicated that the removal of both phosphate itrate increased as the application frequency decreased from 6 times to 2 times/week. The ion of application can be increased as the ency is reduced so that approximately the depth of effluent can be applied to each plot. parison of samples taken during each applica- period indicated only slight differences in nitrate and phosphate renovation during a suggesting that the grass filtration system d be operated with runs of long duration ated by several days rest. Leaving grass ngs on the plot surface increased phosphate ntrations in the waste water. In laboratory 5-6 hr were required to achieve a 90% reduc- n nitrate concentration from effluent with an concentration of 12 mg/liter nitrate-nitrogen. r field conditions, detention times of 1.5 to 2 the laboratory values were necessary for a r reduction in nitrate concentration. Deten- imes of this length can be obtained by cting the flow rate over the plot with barriers recycling the effluent. (See also W76-03541) IPC)
03558

OF CATTLE FEEDLOT RUNOFF IN CROP UCTION,
s State Univ., Manhattan.
imary bibliographic entry see Field 3C.
3559

ATION OF TREES AND CROPS WITH GE STABILIZATION POND EFFLUENT UTHERN MICHIGAN,
ns and Works, Grand Rapids, Mich.
imary bibliographic entry see Field 5C.
3560

LEGAL CONSTRAINTS ON THE USE OF WASTEWATER FOR FOOD AND FIBER,
Virginia Polytechnic Inst. and State Univ., Blackburg. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W76-03562

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 6B.
W76-03563

RECYCLING FOR A PURPOSE -- BUT FOR WHAT PURPOSE. A SOCIOLOGIST'S VIEW,
Central State Univ., Edmond, Okla. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W76-03564

THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROGRAM,
Michigan State Univ., East Lansing. Inst. of Water Research.
T. G. Bahr, R. C. Ball, and H. A. Tanner.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 362-376. 2 fig, 3 ref, 1 tab. OWRT A-031-MICH(4).

Descriptors: *Waste water treatment, *Recirculated water, *Treatment facilities, *Research facilities, Research equipment, Design, Irrigation, Forests, Coniferous forests, Pine trees, Lakus, Nitrogen compounds, Phosphorus compounds, Nutrients, Cultivated lands, Groundwater, Water quality, Water level fluctuations, Activated sludge, Michigan, Water purification, Water pollution treatment, Water pollution control, Aquiculture, Research and development, Soil disposal fields.

A description is given of the development and design of Michigan State University's waste water recycling program and facility for studying the application of waste water to agriculture lands or to aquaculture systems to produce food and fiber and at the same time achieve a high degree of water renovation. The physical facility consists of a conventional activated sludge sewage treatment plant, a 4.5 mile long transmission line, a lake system (186 total acres including 40 acres of lakes), and a land irrigation system. The land irrigation system includes a pine plantation, cultivated fields, and fields that have been allowed to regress into old-field plant associations. Sixty wells surrounding both the lake and land sites will be used to monitor the level and quality of subsurface water. The physical facility affords maximum flexibility in the development of research involving an integrated land and lake system for the restoration of water quality and the recycling of nutrients (nitrogen and phosphorus). The types of studies that will be carried out with the facility and the monitoring of the chemical, physical, and microbiological parameters connected with both the operation of the waste water treatment plant and with the lake and land facets of the recycling system are described. (See also W76-03541) (Witt-IPC)
W76-03565

EXPERIENCES WITH A MARINE AQUACULTURE-TERTIARY SEWAGE TREATMENT COMPLEX,
Woods Hole Oceanographic Institution. Mass.
J. E. Huguenin, and J. H. Ryther.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 377-386. 2 fig, 14 ref.

Descriptors: *Research facilities, *Sewage treatment, *Aquiculture, *Tertiary treatment, Massachusetts, Mollusks, Oysters, Clams, Mussels, *Waste water treatment, Wastes, Operations research, Food chains, Facilities, Pilot plants, Experimental models, Water pollution control, Water pollution treatment, Phytoplankton, Marine animals.
Identifiers: Woods Hole Oceanographic Institution(Mass), Scallops.

The design features of the combined aquaculture-tertiary sewage treatment system at the Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, is described briefly, and experiences in the operation of the experimental system are described. The essence of the concept is a treated sewage-marine phytoplankton-bivalve mollusk (oysters, clams, mussels, scallops) food chain. Problems associated with the design of the plant and operation are also described. The facility produces adequate quantities of waste-grown seafoods for testing and possibly even for preliminary market testing. (See also W76-03541) (Witt-IPC)
W76-03566

POLYCULTURAL WASTEWATER RECLAMATION AT CALIFORNIA POLYTECHNIC STATE UNIVERSITY--AN ACADEMIC INSTRUCTIONAL SYSTEM,
California Polytechnic State Univ., San Luis Obispo. Dept. of Biological Sciences.
R. J. Krejsa.
In: Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 387-4034 fig, 10 ref, 3 tab.

Descriptors: *Research facilities, *Water reuse, *Waste water(Pollution), California, Biological treatment, Waste treatment, Lagoons, Aquiculture, Irrigation, Training, Education, Water pollution treatment, Water pollution control, Fish farming, Fish hatcheries, Water quality, Soil properties, Pathology, Fish diseases, Crops, Laboratories, Reclaimed water.

A description is given of the proposed waste water reclamation system designed by students of California Polytechnic State University, San Luis Obispo, California, under the direction of instructional staff and faculty. Construction of a biological treatment lagoon and experimental ponds for growing fish have been completed. Future plans call for the construction of an aquaculture unit consisting of an experimental hatchery and dry laboratories, raceway system, and a series of small ponds. The total facility will be used to investigate alternative biological and agricultural strategies of secondary treated waste water reclamation and reutilization, to monitor changes in water and soil quality attendant with the processing of waste water through the polyculture system, student training, and pulic education. The facility will utilize secondary effluent from the California Men's Colony waste water treatment plant to grow harvestable crops hydroponically, aquaculturally, and agriculturally. The aquaculture unit wet laboratories will facilitate the study of reproductive behavior, hatching, and rearing of warm or cold water fishes. The dry laboratory portions will be equipped to study pathology of fishes and other organisms growing in the secondary effluent. (See also W76-03541) (Witt-IPC)
W76-03567

COLIFORM AND PHYTOPLANKTON STUDIES IN A BRACKISH WATER AQUACULTURE POND FERTILIZED WITH DOMESTIC WASTEWATER,
Washington Univ., Seattle.
For primary bibliographic entry see Field 5A.
W76-03568

MINERAL QUALITY OF FISH POND EFFLUENT RELATED TO SOIL PROPERTIES AND CROP PRODUCTION,
Arkansas Univ., Fayetteville.
For primary bibliographic entry see Field 3C.

W76-03569

THE DIALECTICS OF A PROPOSAL ON BIOLOGICAL CONTROL OF EUTROPHICATION IN SEWAGE LAGOONS,
National Taiwan Univ., Taipei.
For primary bibliographic entry see Field 5C.
W76-03570

THE HARVESTING OF ALGAE AS A FOOD SOURCE FROM WASTEWATER USING NATURAL AND INDUCED FLOCCULATION TECHNIQUES,
Louisville Univ., Ky.
J. L. Pavoni, S. W. Keiber, and G. T. Boblitt.
In: Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 435-496. 34 fig, 45 ref, 1 tab.

Descriptors: *Algae, *Flocculation, *Waste water treatment, *Harvesting of algae, Microorganisms, Nutrients, Separation techniques, Waste treatment, Water purification, Water pollution treatment, Water pollution control, Reviews, Publications, Chemical precipitation, Polymers, Polyelectrolytes, Anions, Cations, Hydrogen ion concentration, Organic compounds, Neutralization, Research and development, Harvesting.

One of the serious drawbacks in any nutrient removal system involving algae is the separation of these microorganisms from the corresponding liquid phase. Numerous techniques have been investigated for their usefulness in algae harvesting. While the majority of methods are costly, properly managed flocculation techniques may offer a feasible, as well as economical, solution to algal-liquid separation. The literature dealing with bioflocculation and chemical flocculation of algae is reviewed, and the results of experimental studies on the feasibility of harvesting algae from waste water systems by natural or induced flocculation techniques are presented. The mechanism of algal bioflocculation is interpreted as resulting from the interaction of high molecular weight exocellular polymers, which accumulate at the microbial surface during endogenous growth. These polymers electrostatically or physically bond, and subsequently bridge, the cells of the dispersion into a three-dimensional matrix of sufficient magnitude to subside under quiescent conditions. The optimum pH for algal agglutination with synthetic organic polyelectrolytes is 2-4. Optimum dosages of all synthetic polymers at optimum pH levels were in the range of 0.5-5.0 mg/liter. At neutral pH the cationic polyelectrolytes effectively flocculated the algal suspension through a combination of polymer bridging and charge neutralization, whereas anionic and nonionic polyelectrolytes failed to flocculate the algae efficiently. The addition of trivalent metal ions enhanced algal flocculation. (See also W76-03541) (Witt-IPC)
W76-03571

CRITICAL VARIABLES IN FOOD-ITEM POPULATION DYNAMICS IN A WASTE-WATER AQUACULTURE SYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 3C.
W76-03572

THE FEASIBILITY OF PENAEID SHRIMP CULTURE IN BRACKISH PONDS RECEIVING TREATED SEWAGE EFFLUENT,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 5C.
W76-03573

STANDING CROPS OF BENTHIC FAUNA IN MARINE AQUACULTURE PONDS USING RECLAIMED WATER,
Humboldt State Univ., Arcata, Calif.
For primary bibliographic entry see Field 5C.
W76-03574

CONTROLLED EUTROPHICATION: SEWAGE TREATMENT AND FOOD PRODUCTION,
Texas Univ. Medical Branch at Galveston.
J. G. Songer, N. M. Trieff, R. F. Smith, and D. Grajcer.
In: Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 529-545. 8 fig, 10 ref, 1 tab.

Descriptors: *Eutrophication, *Sewage treatment, *Marine algae, *Brine shrimp, Shrimp, Waste water treatment, Sewage, Water pollution sources, Water pollution treatment, Biochemical oxygen demand, Water quality, Phosphorus, Nitrogen compounds, Coliforms, Bacteria, Salmonella, Shigella, Sewage bacteria, Aquatic animals, Foods, Commercial shellfish, Aquiculture, Water pollution control, Waste treatment, Food chains, Nutrients.
Identifiers: Tetraselmis chui, Artemia salina.

A continuous-flow laboratory-scale system has been developed for studying the eutrophication of raw sewage by the marine alga Tetraselmis chui. The subsequent algal proliferation is fed to brine shrimp (Artemia salina). Various water quality parameters are studied, and the passage of certain bacterial groups through the system is examined. Effluent BOD values, though much improved over raw sewage, are somewhat above the standard required of secondary treatment plants (i.e., 20 mg/liter). Total solids (residue on evaporation) was higher in the effluent than in the raw sewage, attributable in part to the presence of algal cells and also to some slight evaporation. Phosphorus was higher in the effluent than in the algal culture because of loss of phosphorus from bottom sediments in the brine shrimp tank. Nitrogenous wastes of the brine shrimp are probably the cause of higher nitrogen values in the effluent than in the algal culture. Fecal coliforms disappeared on passage of the raw sewage through the system. No serotypes of Salmonellae or Shigellae were detected at any stage. (See also W76-03541) (Witt-IPC)
W76-03575

PRINCIPLES OF SEWAGE TREATMENT THROUGH UTILIZATION IN FISH PONDS,
National Agricultural Quality Control Inst., Budapest (Hungary).
E. Donaszy.
In: Wastewater Use in the Production of Food and Fiber--Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 546-556. 6 ref.

Descriptors: *Sewage treatment, *Fish farming, Water pollution sources, Water pollution treatment, Sewage, Wastes, Waste treatment, Fisheries, Publications, Reviews, Operations, Fish, Aquiculture, Fertilization, Planning.

The literature dealing with the use of sewage as food in fish ponds and some results of previous studies in this area are reviewed. The physical aspects and operation of a commercial fishery are described, and the biological potential of fisheries supplied with sewage is discussed. There are great advantages in integrating sewage treatment with commercial fisheries with respect to fish production and waste utilization. A brief description is given of a fishery established for the purpose of sewage treatment, and the planning of a commerial fishery for the introduction of sewage is considered. Needed research in this field is outlined. (See also W76-03541) (Witt-IPC)
W76-03576

REUSE OF WATER IN THE PULP AND PAPER INDUSTRY,
Australian Paper Manufacturers Ltd., Melbourne (Australia).
For primary bibliographic entry see Field 3E.
W76-03578

A SEMIAUTOMATED PROCEDURE FOR TE DETERMINATION OF PHOSPHORUS WATER, WASTE WATERS AND PARTIC LATES,
New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 5A.
W76-03579

(PAPETERIES DE FRANCE) AUSSEDAT-RE INAUGURATION OF THE NEW EFFLUE PURIFICATION STATION AT SAILL (FRANCE) (INAUGURATION A SAILLAT LA NOUVELLE STATION D'EPURATION D EAUX RESIDUAIRES),
D. Ladmiral.
La Papeterie, Vol 97, No 7/8, p 449-4 July/August, 1975. 1 fig, 5 illus.

Descriptors: *Waste water treatment, *Treatm facilities, *Pulp wastes, Europe, Foreign co tries, Water purification, Aerated lagoons, Slu disposal, Incineration, Sludge, Biochemical ygen demand, Suspended solids, Wastes, Indus al wastes, Water pollution treatment, Water po tion control, Pulp and paper industry.
Identifiers: *France, paper machines.

Following a brief review of the facilities of pulp and paper mill at Saillat, including Duoformer paper machine, the effluent treatn system is outlined. The system handles the 400 m effluent/hr coming from the mill and consist sentially of a homogenizing basin, a primary c fier, a canal-type aeration lagoon, and sludge cinerating equipment. Effluent discharged f the aeration lagoon has a BOD of about 9 kg and maximum suspended solids of 20 kg (Speckhard-IPC)
W76-03580

REPORT ON WASTEWATER SERV CHARGES, METROPOLITAN SEWERAGE TRICT, BUNCOMBE COUNTY, NO CAROLINA.
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-03628

ORGANIC COMPOUNDS IN PULP M LAGOON DISCHARGE,
Washington Univ., Seattle. Coll. of F Resources.
For primary bibliographic entry see Field 5A.
W76-03631

WASTE CONTROL AND ABATEMENT IN PROCESSING OF SWEET POTATOES,
North Carolina State Univ., Raleigh. Dept. of Engineering.
C. Smallwood, Jr., R. S. Whitaker, and N. V. Colston.
Available from the National Technical Inf tion Service, Springfield, Va. 22161, as P 469, available in microfiche only, :2.25. En mental Protection Agency, Report EPA-66 021, December 1974. 50 p, 4 fig, 9 tab, 3 03J1P00835.

Descriptors: *Sweet potatoes, *Waste water ment, Costs, Industrial wastes, *Chemical w Recycling, *Water reuse.

The conventional processing of sweet po produces a very strong caustic waste that is organic matter. Present technology doe emphasize recirculation or other control of use. Improved technology is available such pressure low-volume water sprays and caustic peeling process that reduce water u convert the liquid caustic waste to a sem waste that can be disposed of in sanitary l

sold as cattle feed. Developing technology of-
rs the potential of lye recovery, an improved
eam peel or an infrared dry caustic peel that in-
eases yield. In-plant control of waste through
ocess modification and/or treatment is economi-
l and may even provide a net return on invest-
nt. Biological treatment is effective. This report
s prepared to make available the data collected
der the first phase of the study. The majority of
analytical data characterizing sweet potato
ocessing wastes were obtained from an in-depth
dy of one conventional sweet potato processing
nt during the 1971 processing season. (EPA)
76-03636

**PERIENCE IN THE SANITARY PROTEC-
ON OF WATER BODIES IN A RAION OF
OSCOW, (IN RUSSIAN),**
itary Epidemiology Station, Konakovo
SSR).
M. Grinblat, V. F. Sundatov, T. I. Gusarova,
G. G. Verenova.
Sanit, 8, 87-88, 1974.

scriptors: Water pollution control, Waste water
tment, *Treatment facilities, *Water pollution
rces, Design operations, *Water quality con-
, Public health.
ntifiers: *Moscow River(USSR), Raion, Rus-
-SFSR, USSR.

reased attention of the sanitary-epidemiologi-
station of the Krasnopresnensk raion of
scow (Russian SFSR, USSR) to protection of
face waters resulted in a determination of all
tewater discharge sources, the improvement
reatment plant design and operation and, con-
iently, an improvement in the water quality of
Moscow River and its tributaries in the region.-
pyright 1975, Biological Abstracts, Inc.
-03637

**AMOLOGICAL EFFECTS OF FISH
TCHERY DISCHARGE,**
t Mary's Coll., Winona, Minn.
primary bibliographic entry see Field 5C.
-03650

**IDIZED BED FURNACE HAVING COARSE
TICLE DISCHARGING DEVICE,**
nstalh A.G., Dortmund (West Germany).
primary bibliographic entry see Field 5E.
-03661

**IGN AND OPERATION OF HIGH-RATE
TERS-PART 1,**
tgomery (James M.), Inc., Pasadena, Calif.
r Treatment Div.
awamura.
rican Water Works Association Journal, Vol
lo 10, p 535-544, October, 1975. 7 fig, 3 tab, 35

riptors: *Waste water treatment, *Water
ment, *Filtration, *Filters, Equipment,
gn criteria, *Operation and maintenance,
omics, Costs, *Design, Filter rates.
ifiers: *High-rate filtration.

rience with high-rate filtration, available for-
, and design criteria are discussed in order to
in economical filter design and operation.
s covered include: historical development of
ion, degree of pretreatment necessary when
conventional rapid sand filters and reverse-
d filters; selection of the filter media;
ed filter media thickness relative to the
grain size; filter rate control; maximum
loss for filters; and, continuous turbidity
oring. The main goal in filter design is to pro-
facility for the steady production of high-
y water with minimum operational and main-
ce costs. The new types of media, filter wash
ns, chemicals for filter aids, or different con-
cepts of filtration now available, require the use of new design criteria. Pretreatment and filtration are closely related; design of pretreatment facilities should depend on the type of filter employed. Selection of filter media should be based on the degree of purification required, the length of filter run, and ease of filter wash to remove lodges suspended matter from filter media. The absolute minimum depth of total filter media should be 300 m in order to provide a safety factor against breakthrough. Filter rate control is divided into five basic types: constant rate filtration; declining rate riltration; constant level filtration; equal loading filtration; and, constant pressure filtration. (Orr-FIRL)
W76-03665

TERTIARY WATER TREATMENT.
Plant Engineering and Technology, p 38, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Pilot plants, *Tertiary treatment, Lime, Coagulation, Filtration, Chlorination, Ammonia, Phosphorus, Nutrient removal, Nitrogen, Activated carbon, Aeration.
Identifiers: BIOX rotating disc aerator.

Toray Engineering Company, Limited, of Japan has built an advanced waste water treatment pilot plant at their Shiga factory. The company plans to branch out into selling tertiary sewage and waste water treatment technology. The pilot plant was designed combining some of the technology developed by CH2M Hill with the BIOX rotating disc aerator developed by Toray Engineering. Waste water receives secondary treatment by means of the BIOX rotating disc aerator. Tertiary treatment includes lime coagulation, carbonate formation, filtration, break-point chlorination, and activated carbon adsorption. Ammonia-nitrogen is decreased to 0.2 ppm, BOD to 1-2 ppm, COD to 1-2 ppm, SS to one ppm, and total phosphorus to 0.06 ppm. The treated water can be used as potable water after chlorination. The waste water is treated in the rotating disc aerator to a degree that is half-way between that of secondary and tertiary treated water. This decreases the consumption of activated carbon and lowers the operating costs. Recycling of calcium carbonate, simplification of ammonia removal, and regeneration of activated carbon are also stressed in the treatment process. The pilot plant costs $330,000 and treats 60 tons of waste water from the cafeterias and dormitories of the Shiga factory. (Orr-FIRL)
W76-03666

MARSH MILLS-THE NEW WORKS TREATING SEWAGE FROM PLYMOUTH.
Surveyor, Vol 146, No 4345, p 39-40, September 19, 1975. 2 fig.

Descriptors: *Sewage treatment, *Waste water treatment, *Storm water, *Treatment facilities, Automatic control, Pumps, Pumping plants, Automation, Aeration, Monitoring.
Identifiers: Great Britain(Plymouth).

The first and second stages of the Marsh Mills sewage treatment works of the South West Water Authority (Great Britain) have been completed at a cost of 900,000 pounds. The first stage, primary treatment works, superseded the primary treatment facility built in 1957. The second stage provides secondary treatment and automatic control. The main problem with the design of the sedimentation tanks was flotation of the tanks because they extended 6.5 m below the normal groundwater level. Prevention of flotation is accomplished by a combination of pressure relief valves to prevent the ground-water from rising above a specific level when the tanks are empty, and ground anchors to resist the residual upthrust. The main pumphouse is a reinforced concrete frame building with brickwork infill walls. It contains two comminutors, two 250 mm and three 175 mm main sewage pumps, two 200 mm diameter reciprocating sludge pumps, grit tank blowers and switchgear, and staff accomodations. There are standby sets for all pumps, blowers, and comminutors. Overall control of the works is from the pumphouse; most daily operations can be performed automatically. Automatic functions include: separation of storm water; monitoring and returning storm water to the main flow during low flow periods; sludge drawoff; sludge pumping and measurement; monitoring of return and surplus sludge; and, aeration control. Secondary treatment is provided by four Simplex aeration cones; the amount of aeration is controlled by dissolved oxygen electrodes in the tank. (Orr-FIRL)
W76-03667

TEMPERATURE EFFECTS ON AEROBIC DIGESTION KINETICS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemical Engineering.
C. W. Rondall, J. B. Richards, and P. H. King.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No EE5, p 795-811, October, 1975. 11 fig, 9 tab, 23 ref, 1 append.

Descriptors: *Waste water treatment, *Activated sludge, *Kinetics, Temperature, Aerobic conditions, Laboratory tests, Analytical techniques.
Identifiers: *Aerobic digestion.

Research was conducted to determine under controlled conditions the effects of a wide range of digestion temperatures on the aerobic digestion process and the subsequent dewaterability of the resulting digested sludges. Waste activated sludge was digested in batch reactors for 15 days at temperatures of 5, 10, 30, 35, and 45C. The selection of an optimum temperature depends on the principal goal to be achieved; however, neither 5 or 45C should be selected as an aerobic digestion temperature if batch reactors are used. The water quality from the 20C reactor was slightly better, but there was little difference in quality from 10 to 35 . Stabilization of the mixed liquor was best at high temperatures. The oxygen required per unit volatile solids destroyed was lowest at the low temperatures. Optimum filterability occurred at a digestion temperature of 35C. Maximum solids destruction occurred in the 20C reactor. Generally, there was not much difference in the performances of the 20, 30, and 35C reactors. The kinetics of digestion were in good agreement with accepted temperature variation theory for the reactor temperatures at 20C and below. However, the values from the digesters operated at higher temperatures do not conform at all. Above 20C, the endogenous destruction of waste activated sludge cannot be described as a chemical reaction; environmental factors and population dynamics considerations are more important. There seems to be no practical advantage to aerobic digestion temperatures higher than 20C. (Orr-FIRL)
W76-03668

USE OF POLYELECTROLYTES FOR OVERLOAD CLARIFIERS,
McMaster Univ., Hamiliton (Ontario). Dept. of Chemical Engineering.
A. Benedek, J. J. Bancsi, and J. W. G. Rupke.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2447-2460, October, 1975. 14 fig, 3 tab, 10 ref.

Descriptors: *Polyelectrolytes, *Overflow, *Waste water treatment, Activated sludge, *Supended solids, Phosphorus, International water, Laboratory tests, Chemical oxygen demand, Treatment facilities, Canada, United States, Great Lakes Region, Effluents, Nutrient removal.
Identifiers: *Clarifiers, Alum, Hydraulic loading.

Agreement between Canada and the United States requires the removal of phosphorus by waste

water treatment plants in the Lower Great Lakes Region. The batch settling properties of an alum-polyelectrolyte waste water system is examined in the laboratory and the clarifier performance of predicted in full scale. Full-scale data with primary alum and polyelectrolyte addition ion the chosen water pollution control plant at overflow rates is obtained to predict the maximum permissible hydraulic loading for a primary clarifier. The laboratory predictions are compared with the results of the full scale study. In the batch settling procedure, alum was added at the time zero, and then, five minutes later, the polyelectrolyte was added. The system was rapidly mixed for the first five minutes and slowly mixed the next fourteen minutes, after which samples were taken at preset intervals. This simulated the plant study, in which alum was added in one part of the line and polyelectrolyte was added further downstream. Samples were analyzed for total and filtered phosphorus, total and filtered chemical oxygen demand, and suspended solids. Samples were frozen for preservation, but this introduced about a 40% error into the suspended solids determination. The standards for effluent phosphorus concentration that had to be met were one mg/liter 80% of the time in jar tests and 50% of the time in plant operation. In the batch settling tests, alum with polyelectrolyte reduced phosphorus concentrations by 44% more than alum alone and increased overflow rates. In the activated sludge plant, the phosphorus, suspended solids and chemical oxygen demands were reduced and the overflow rate was increased. (Pinto-FIRL)
W76-03669

PROCESS CONTROL BY OXYGEN-UPTAKE AND SOLIDS ANALYSIS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
L. D. Benefield, C. W. Randall, and P. H. King.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2498-2503, October, 1975. 2 fig, 6 ref.

Descriptors: Oxygen, *Solids contact processes, Waste water treatment, *Activated sludge, Analysis, Sludge treatment, Microorganism, Mathematics, Control systems.
Identifiers: Process control, *Oxygen-uptake, *Solids analysis, Clarifiers, Sludge age, Sludge wasting, Substrate concentration.

The most common methods used by plant operators to control the activated sludge process are discussed. The theoretical basis for another method having certain advantages over the others was studied. Four control methods in common use are: sludge wasting to maintain a constant mass of organisms in the system; sludge wasting to maintain a constant specific rate of substrate utilization; sludge wasting to maintain a constant sludge age; and, hydraulic control to maintain a constant sludge age. The last two, in which the sludge age is kept constant, are the most favorable ones. The major weakness in these methods is the continual shifting in the solids balance between the aeration tank and the clarifier as the influent flow rate deviates. A new method is proposed in which the solids separate at a rate such that the required solids concentration is maintained in the sludge return lines and no microbial growth occurs in the secondary clarifier. Advantages of this method include: the effect of the fluctuating solids level in the secondary clarifier is minimized; any change in the influent substrate concentration will be reflected immediately in the oxygen uptake rate; and loading fluctuations can be compensated for by varying the interval between control periods. Disadvantages of this method include: the requirement for a laboratory study to determine changes in the constants; more operator attention than is required in the hydraulic method for controlling sludge age; and mathematical manipulations are required than in any other of the methods. (Pinto-FIRL)
W76-03670

DYNAMICS OF NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS,
Tennessee Eastman Co., Kingsport.
R. A. Poduska, and J. F. Andrews.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Lafayette, Indiana, Purdue University, p 1005-1025, 15 fig, 8 tab, 36 ref.

Descriptors: *Nitrification, *Activated sludge, *Waste water treatment, Nitrate, Nitrite, Nitrogen, Ammonia, Mathematical models, Continuous flow, Dissolved oxygen, Bacteria, Industrial wastes, Domestic wastes, Sludge treatment, Oxidation.
Identifiers: Monod relationships.

The transient responses of a nitrifying activated sludge process to various dynamic forcings in continuous flow laboratory scale reactors were studied. A dynamic model of nitrification in the activated sludge process was developed and verified with data taken in the study. Two types of bacteria are responsible for nitrification: Nitrosomonas oxidizes ammonium to nitrite, and Nitrobacter oxidizes nitrite to nitrate. These bacteria survive well in domestic wastes but not in industrial wastes because of growth inhibiting chemicals and adverse pH conditions. Proper sludge age, pH, temperature and dissolved oxygen concentration are necessary for the survival of the bacteria. Stochiometric analysis was performed to determine the necessary dissolved oxygen concentration. A kinetic mathematical model provides a theoretical basis for nitrification. The dynamic model in the study uses the Monod relationship between specific growth rate and substrate concentration. The differential equations are solved by computer. Three identical systems were used to test the dynamic model. The temperature was kept at a constant 23C and the pH was kept at a constant 7.2. A mixed culture of nitrifying bacteria and heterotrophic bacteria was used. The dynamic model adequately represents the dynamic responses of nitrification in the experimental system for various input forcings. Sludge age is the basic parameter for determining the degree of nitrification in an activated sludge system. (Pinto-FIRL)
W76-03672

OZONE FIGHTS ODORS.
Water and Wastes Engineering, Vol 12, No 10, p 39, October, 1975.

Descriptors: *Ozone, *Odor, *Waste water treatment, *Sewage treatment, *Treatment facilities, Equipment, Sewage effluents, Georgia.

An odor control system has been installed in a new 20 mgd sewage treatment facility in Savannah, Georgia. The Savannah Water Pollution Control plant handles about 12 mgd of sewage effluent. Approximately 30,000 cfm of air containing gas and odors is drawn off the screen room and grit chambers through fiberglass ducts and fed into a contact chamber. Ozone is injected into the air stream, with a contact time of about 6.3 seconds. Ozonated air is exhausted into the atmosphere through a duct in the ceiling of a chamber. Any airborne sulfides, amines, or mercaptans are oxidized and the exhausted air is odorless and germ-free. The oxonator for this facility uses atmospheric air, and produces over 25 lb/day of ozone. Ozone is discharged from the ozonator at a pressure between 3 and 7 psig, through stainless steel pipe directly into the exhaust duct. (Kramer-FIRL)
W76-03673

ELECTROLYTIC DEPHOSPHORATION AND DENITRATION.
Plant Engineering and Technology, p 38, 1975.

Descriptors: *Denitrification, *Nutrient removal, *Electrolysis, Tertiary treatment, Activated sludge, *Waste water treatment, Adsorption, Phosphorus, Nitrogen, Adsorption.
Identifiers: *Dephosphoration.

A new technology for removing phosphorus ar nitrogen compounds from sewage and plant was water has been developed in Japan. Electrolysis used to change the phosphorus and nitrogen co pounds contained in water into non-watersolub sludge, with a nearly 100% removal rate. Was water is electrolyzed while being mixed with a tivated diatomaceous earth obtained from electr ysis and sea water which has been subjected preliminary electrolysis at a pH below seve Phosphorus compounds and ammonia are sorbed on the activated diatomaceous ear Phosphorus compounds are changed into calci phosphate by reaction with calcium compour dissolved in the water. Previous methods of ter ry treatment have included: a body-feed method which activated carbon powder is used as ads bent, a method making use of synthetic zeolite sorbent, and a method using a anthracite ads bent. These cost about 30 yen per ton of water be treated. In comparison, the electrolysis meth costs less than ten yen for one ton of waste wa and operates very quickly. (Kramer-FIRL)
W76-03675

WASTE SLUDGE TREATMENT WITH PR SURE FILTRATION,
Passavant Corp., Birmingham, Ala.
H. W. Forester.
Filtration Engineering, Vol 6, No 6, p 9-12, S tember/October, 1975. 3 fig, 1 tab.

Descriptors: *Sludge, Wastes, Press *Filtration, Waste treatment, Dewater Groundwater, Leachate, Cost analysis, *W water treatment, Waste disposal, Suspen solids, Landfills, Separation techniques, *Sl treatment.
Identifiers: Filter cakes, Filtrate, *Pressure fi tion, Vacuum filtration, Liquid-sold separat High pressure filtration.

Liquid-solid separation requires a force to d the liquid through the accumulated solids. sure filters require a pressure differential three atmospheres to a multiple of that force operation. For higher multiples, the term pressure filtration is often used. This ter misleading in that it implies danger to perso and high operating costs. The inaccuracy of myth is despelled in this study. Two metho filter cake disposal are discarding it on a la and incinerating it and discarding the ash landfill. Higher pressure produces higher concentration in the filter cake, resulting in hauling costs. Also, since filter cake is scruti from the standpoint of leachate and groundw contamination, it can be assumed that filter with higher solid concentrations will have leachate. Another consideration is that h pressure will increase the filter capacity, decreasing landfill costs. If the filter cake is incinerated, then the higher pressure will inc the solids concentration, causing the filter ca burn more efficiently. A particular advanta pressure filtration is the relatively clear fi that is produced. The suspended solids co about twenty times less than the filtrate pro by vacuum filtration. Other process proble be solved in a dewatering plant include pu the viscous and abrasive sludge at a constan rate, which can be solved by using a mech feed pump with an equalizing tank, and cons ing conveyors and operating valves at the c time. (Pinto-FIRL)
W76-03676

DRY SPREADER SOLVES SEWAGE TI MENT PLANT PROBLEMS.
For primary bibliographic entry see Field 5E
W76-03677

FROM LAGOONING TO FARMLAND A CATION: THE NEXT STEP IN LIME SL DISPOSAL,
Northern Illinois Water Corp., Champaign.

A. Russell.
nerican Water Works Association Journal, Vol
No 10, p 585-588, October, 1975. 4 fig, 3 tab.

scriptors: *Waste disposal, *Sludge disposal,
/ater treatment, *Waste water treatment,
conomics, Dewatering, Agriculture, *Lime,
goons, Recycling, Neutralization, Illinois.
ntifiers: *Dry spreader, Land application.

e water-waste management program for the
ampaign-Urbana community in Illinois is
cribed. Because of the hardness of the water,
e-softening operations have been used since
l to reduce the hardness to 80 mg/liter. The
e-softening sludge had been deposited in
oons, but as the population has increased, the
ginal lagoons have been expanded. Presently,
re is a lack of available land, and an alternative
sought to aid or eliminate the lagooning
cess. Recalcination and reuse was not an
nomically feasible alternative, and geographi-
limitations made discharge to a watercourse
ractical. The solution found was that of appli-
on of naturally dewatered lime sludge to farm-
d. Because the soil of this area is acidic from
ogen-ammonia fertilizer application, it is
essary to neutralize it periodically. A test per-
ned on Champaign-Urbana lime sludge in-
ted that it was 94.9% effective as pure calcium
onate. Handling the application of lime sludge
be achieved with a dry spreader, originally
gned for waste water sludge disposal. Experi-
ts with this spreader showed that naturally de-
ered lime sludge may be hauled in bulk and
ed near the field prior to application. The
ader may then be filled at the site, thus
inating travel time between the lagoon and the
. The new technique will probably be imple-
ted in the near future. (Kramer-FIRL)
-03678

**ELOPMENTS IN SEWAGE TREATMENT
LEEDS,**
kshire Water Authority (England). North Cen-
Div.
Hudson, and G. A. Phillips.
er Pollution Control, Vol 74, No 5, p 544-559,
9 fig, 10 tab, 6 ref.

riptors: *Sewage treatment, *Waste water
ment, *Treatment facilities, Activated sludge,
gical treatment, Filtration, Filters, Pumping,
ge treatment, Sludge disposal, Costs, Water
ty standards.
ifiers: Leeds(Great Britain).

most recent developments in the moderniza-
of Knostrop sewage works in Leeds, Great
in, are detailed. The main objective was to
a plant capable of producing an effluent to
River Authority standards. The plant in ex-
ce had been built 56 years ago and depended
manual operation. Improvements (due to the
cost of labor) therefore, necessitated some
e of automation. In the past two years, an ac-
d sludge plant, heat treatment plant, and in-
ator have been put into operation. In addi-
major changes have been made in the biologi-
lters and obsolete pumping equipment has
replaced. New reconstruction has also begun
high-level inlet works. The major problems
ntered have been related to sludge treatment
sposal. (Kramer-FIRL)
03679

**UENCE OF COLLOIDAL PARTICLES ON
ATERING OF ACTIVATED SLUDGE
POLYELECTROLYTE,**
sh Inst. for Surface Chemistry, Stockholm.
berts, and O. Olsson.
onmental Science and Technology, Vol 9,
p 945-948, October, 1975. 5 fig, 21 ref.

iptors: *Polyelectrolytes, *Dewatering,
vated sludge, *Sewage treatment, Waste water treatment, *Colloids, Cations, Polymers, Sludge, Flocculation.
Identifiers: Capillary Suction Time.

Problems in finding the best polyelectrolyte and in controlling polyelectrolyte dosage under different operating conditions have occurred with sludges of biological origin. The dewatering of activated sludge samples with solids contents under 1% was studied using Capillary Suction Time techniques and a cationic polyelectrolyte for flocculation. It was found that the polelectrolyte dosage for optimal dewatering was independent of the original solids content of the sludge. The dosage also corresponded to the amount of polyelectrolyte required to obtain a zero charge on the anionic colloidal particles in the sludge. It was further shown that the negative charge on the colloidal particle could be partially neutralized using a metal hydroxide rather than a cationic polyelectrolyte. This reduced the polyelectrolyte requirement for dewatering of the total sludge correspondingly. Dewatering of low-solids activated sludges from domestic sewage treatment plants with cationic polyelectrolyte can be determined largely by interactions between the cationic polyelectrolyte and the colloidal materials in the sludge. The mechanism of dewatering is probably a cross-linking of the added cationic polyelectrolyte with the natural anionic monomers and polymers in the sludge. (Kramer-FIRL)
W76-03680

CANADIAN WASTEWATER PLANT FEATURES MANY FIRSTS.
Public Works, Vol 106, No 11, p 58-59, November, 1975. 3 fig.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, *Sewage treatment, Pilot plants, Biological treatment, Industrial wastes, Sludge treatment, Incineration, Waste water disposal, Sludge disposal, Methane, Canada.
Identifiers: Hamilton(Ont).

The secondary treatment phase of the waste water treatment facility for Hamilton, Ontario, was completed in 1974 at a cost over $25 million. Activated sludge treatment, pressure flotation for excess activated sludge thickening, additional digester, filter and boiler capacities, sludge incineration, standby power facilities, and landscaping were added in this phase. The plant includes many innovative design features such as four 83 inch diameter Archimedean pumps. Plant capacity is 60 million imperial gallons per day (migd), with some components having a hydraulic capacity of 120 migd for expansion. A 5,000 igpd pilot plant is used for studying the effects of biological treatment of industrial wastes discharged to the sewer systems, and for determining the effectiveness of nutrient removal processes. The chlorinated secondary effluent is discharged to the Hamilton Bay. Sludge is conditioned with polyelectrolytes, subjected to pressure flotation, digested, filter pressed, and then incinerated in one of two circular, mechanically rabbled, multiple hearth air cooled incinerators. Methane gas from the sludge digestion process is the main combustion fuel. (Orr-FIRL)
W76-03681

LOOP AERATION TANK DESIGN OFFERS PRACTICAL ADVANTAGES, PART I,
Metcalf and Eddy, Inc., Palo Alto, Calif.
A. Jacobs.
Water and Sewage Works, Vol 122, No 10, p 74-75, October, 1975. 2 fig, 6 ref.

Descriptors: *Activated sludge, Aeration, *Treatment facilities, Flow, *Waste water treatment, Mixing, Oxygen, *Design criteria, Computers, Equipment.
Identifiers: *Carrousel aeration system, *Aeration tanks.

The Carrousel aeration system (used in Europe since 1968) is a hydraulic variation of the activated sludge process that uses the hydraulic properties of a mechanical aerator to maintain adequate velocity and turbulanec necessary for suspension of MLSS in deep channels with only a limited expenditure of energy. It combins plug flow and complete mix, and was developed as an economical alternative to the oxidation ditch. The Carrousel aeration tank is a mechanically aerated continuous channel. Oxygen is supplied to the mixture by a conventional vertical shaft, mechanical aerator at the influent end of the channel. The tank contents make one revolution through the channel every 10-30 minutes. An amount equal to the influent flow is constantly displaced over the effluent weir. The following steps must be followed in order to size the Carrousel system. The oxygen requirement and tank volume must be determined for a particular waste based on the food to mass (f/m) ratio, solids retention time, BOD, and flow. The type of mechanical aerator that can maintain the required channel velocities and oxygen content is chosen. The aeration tank aerator section and channel dimensions are then determined based on the aerator type selected. The channel depth is normally about 1.1 times the impeller diameter, while the channel width is about 2 times the channel depth. The channel length is determined based on the required volume, channel depth, and width. A computer program can then be used to optimize the dimensions for the particular aerator chosen and the tank volume. (See also W76-03683) (Orr-FIRL)
W76-03682

LOOP AERATION TANK DESIGN OFFERS PRACTICAL ADVANTAGES, PART II,
Metcalf and Eddy, Inc., Palo Alto, Calif.
A. Jacobs.
Water and Sewage Works, Vol 122, No 11, p 74-75, November, 1975. 4 fig, 2 tab, 6 ref.

Descriptors: *Activated sludge, *Waste water treatment, Aeration, Nitrification, Denitrification, *Design criteria, Treatment facilities.
Identifiers: *Carrousel aeration system, *Aeration tanks.

The Carrousel aeration system has several advantages over conventional aeration tank configurations. The fact that the effluent must make at least one loop through the tank before any portion of it can be discharged eliminates short-circuiting. Buffering capacities are provided that are similar to those afforded by complete mix designs. The relatively small number of aerators reduces the maintenance costs and capital costs. Not all the aerators must be operated to provide adequate channel velocities during low-flow periods which reduces electrical consumption. The Carrousel process requires less oxygen than complete mix processes at the same loading which achieves about a 10% power savings. The mechanical shaft, surface aerator used in current installations is economical, efficient, reliable and durable. Slow speed aerators are generally employed. The Carrousel system can combine nitrification and denitrification in one system. If the dissolved oxygen concentration is one of the channel reaches is maintained close to zero mg/liter, then denitrifiers present in this reach will become active and reduce the previously nitrified waste. Raw sewage is used as the carbon source for denitrification which eliminates the need for methanol addition. A 12 day sludge age is necessary to maintain the nitrifiers and denitrifiers in the system. As of September 1973, there were 19 Carrousel plants operating in the Netherlands, 19 operating in France, and another 67 either under construction or being designed. Some of the operating data for a plant in Lichtenvoorde, Netherlands, is graphically presented. (See also W76-03682) (Orr-FIRL)
W76-03683

EFFICACY OF BIOLOGICAL NITRIFICATION,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
P. M. Sutton, K. L. Murphy, B. E. Jank, and B. A. Monaghan.
Journal Water Pollution Control Federation, Vol 47, No 11, p 2665-2673, November, 1975. 7 fig, 4 tab, 11 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Nitrification, Biological treatment, Pilot plants, Temperature, Nitrogen, Ammonia.
Identifiers: Solids retention time, Alum.

Pilot plant studies were performed on carbon removal and nitrification efficiencies obtained from three differently organized activated sludge treatment processes. These included single- and two-state combined sludge systems and a two-stage separate sludge system. Nitrification, under a series of operating temperatures, and solids retention time (SRT) at pseudo steady-state conditions were compared. The effects on nitrification of ferric chloride and alum addition to a combined sludge nitrification system were recorded. SRT and temperature were the primary factors affecting performance. SRT levels were chosen on the basis of practical design considerations for full-scale facilities. Temperature levels represented values at which treatment plants can work in continental climates. Results indicate that, under pseudo steady-state conditions, separate and combined sludge systems remove equal amounts of filterable total nitrogen at equal system SRT's. Nitrification is independent of mixing and reactor organization in combined sludge systems. Nitrification rate is more sensitive to temperature than the rates for organic removal; temperature sensitivity is reduced with increasing SRT in combined and separate systems; in a separate system, a minimum system SRt of 10 days is required in order to obtain complete nitrification at temperatures nearing 5 C. Adding inorganic chemicals to a nitrifying activated sludge plant at dosages that reach one mg per liter effluent total phosphorous concentrations does not seem to adversely affect nitrification rate. (Waltner-FIRL)
W76-03684

PULSE TRANSFER GIVES THICKER SLUDGE,
Dorr-Oliver, Inc., Stamford, Conn. Environmental Applications.
J. B. Rosenquest, Jr.
Water and Waste Engineering, Vol 12, No 10, p 37-39, October, 1975. 1 fig, 1 tab.

Descriptors: *Pumping, *Pumps, *Sludge treatment, *Waste water treatment, Hydraulics, Dewatering.
Identifiers: Diaphragm pumps, Pulse transfer.

Pulse transfer for moving sludge has been used for more than 7 years at the Hatfield, Pennsylvania, sewage treatment plant and in a series of tests at the Salisbury, Maryland, treatment facility. In pulse transfer, sluge is moved by a diaphragm pump with short intermittent pumping cycles. A spring or vaccum assist has been added to the pump design to provide the pulsing characteristics necessary for moving sludge. Two No. 4 ODS pumps are used at the Hatfield facility to move a combination of primary, secondary, activated, and chemical sludges through a eight inch diameter line. Although the average velocity in the pipe is only one and three-eighths inches, the pulse peak velocity of three feet per second maintains the settleable solids in suspension. The diaphragm pumps have required little maintenance; the diaphragms have been replaced only once in 7 years. The tests conducted at the Salisbury plant determined the effect of pulse transfer on sludge consistency. No dilution occurred if the sludge was allowed to compact in the hopper. Two-minute pulses aided compaction. However, continuous operation reduced the solids content by causing unsettled solids to be drawn off from the upper, less dense portion of the sludge blanket. The beneficial effects of denser sludges include: a reduction in gallons pumped for a given quantity of suspended solids; lower fuel costs for incineration; and, more efficient dewatering filter operation. Pulse transferring removes the thickest available sludge from the hopper as it forms. The withdrawal rate matches the settling rate in the hopper. The density of the sludge can be controlled by manual or automatic means. (Orr-FIRL)
W76-03685

NEW PLANT CUTS PHOSPHATES.
Water and Wastes Engineering, Vol 12, No 10, p 49, October, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Sludge treatment, Sludge disposal, Incineration, Dewatering, Centrifuges, Chlorination, Nutrient removal, Phosphorus, Biochemical oxygen demand, Regional planning, Pennyslvania.
Identifiers: Lower Allen Township(Pa).

A new regional waste water treatment plant has been built by Lower Allen Township, near Harrisburg, Pennsylvania, to replace the original one mgd primary plant built in 1957. Upper Allen Township and the State Correctional Insitution at Camp Hill will also share in the cost and use of the facilities. The waste water is pumped through a distribution chamber to primary clarifiers which provide both gravity and chemical treatment. Pebbled lime is fed into the clarifiers to remove the phosphorus. Secondary treatment is performed in four aeration tanks; further settling and clarification occur in two final clarifiers. Final treatment is chlornation after which the treated water is released into the Susquehanna River. Sludge is treated in a four step process comprising: degritting by a cyclone process; dewatering in one of the two sludge thickeners; further dewatering in one of two centrifuges; and, incineration in an oil-fired seven level furnace. The process removes 80% of the phosphorus and 85% of the BOD. (Orr-FIRL)
W76-03686

GET THE MOST FROM THE FINAL CLARIFIERS,
Envirex Inc., Waukesha, Wis.
W. H. Boyle.
Water and Wastes Engineering, Vol 12, No 10, p 53-55, 82, October, 1975. 4 fig.

Descriptors: *Waste water treatment, *Activated sludge, Hydraulic machinery, Hydraulics, Sludge, Design
Identifiers: *Clarifiers, Hydraulic removal mechanisms, Sludge return.

The final clarifier performs one of the most important unit functions in the activated sludge process. The hydraulic removal mechanism, sometimes called a vacuum or suction type device, is the preferred sludge collection mechanism when dealing with a light flocculant sludge. A brief review is presented of the main requirements for a hydraulic removal mechanism which are rapid sludge removal, minimum sludge agitation, maximum solids concentration, flexibility, and balanced hydraulic design. One of the two main types of circular hydraulic removal mechanisms is a rectangular tapered header made of 0.25 inch steel plate with orifices drilled into the header for the removal of sludge (the header design). The other device incorporates several withdrawal pipes with the sludge channeled by deflector plates to these pipes and transported to collection wells (riser pipe design). The hydraulic design of each of these devices is explained. The choice of hydraulic sludge removal mechanism should be based on performance, how the device affects the main process requirements, and an economic evaluation of capital and operational/maintenance expenditures. (Orr-FIRL)
W76-03687

OXYGEN TRANSFER EFFICIENCY IN DE
TANKS,
Sanitaire Water Pollution Control Corp., Milwa
kee, Wis.
F. L. Schmit, and D. T. Redmon
Journal Water Pollution Control Federation, V
47, No 11, p 2586-2598, November, 1975. 8 fig
tab, 15 ref.

Descriptors: *Waste water treatment, Aerati
*Treatment facilities, *Oxygenation, Des
criteria, Oxygen requirements.
Identifiers: *Aeration tanks, Oxygen transfer e
ciency.

An investigation was conducted to determine
relationships of oxygen transfer efficiency
power and air requirements to submergence
coarse bubble, wide band aeration syste
Methods used to measure oxygen transfer v
also examined. The tests were conducted in a
that was 34.33 ft wide X 6 ft long X 24 ft d
Water depths up to 23 ft were used. The aera
system was a rotary positive blower driven by
hp electric motor through a V-belt drive. The v
of the dissolved oxygen saturation value (C(
used in determining the mass transfer coeffi
and the respective oxygen absorption had a sig
cant effect on the results obtained. Determi
C(sat) by obtaining the equilibrium or asymp
DP value under test conditions was a reliable
reproducible method. The relationship of per
age oxygen absorption to submergence v
between the 0.76 and 1.08 power of submerg
depending on whether air per unit volume or
air applied was held constant with varying
depths. If the water depth and submergence
fixed, then increased air rate resulted in a
crease in percentage oxygen absorption
transfer capability. The advantages of deep
construction, such as reduced area requirer
and less air compressing and distribution
ment may be obtained with a decreased
power necessary to transfer the required ox
An economic evaluation of aeration tanks d
than 15 ft should be included in the design
of a facility as well as a consideration of th
formance under peak demand conditions.
FIRL)
W76-03691

HIGHER SPEED MAY LOWER PROBLEM
Versar, Inc., Springfield, Va.
D. H. Houck, and R. J. Weis
Water and Wastes Engineering, Vol 12, N
32-34, October, 1975. 4 fig, 2 tab.

Descriptors: *Aeration, *Equipment, *
*Mechanical engineering, *Waste water
ment, Oxygenation, Mechanical equipmen
fles, Impellers.
Identifiers: *High-speed aerators.

With proper understanding of the mecha
volved and suitable engineering for each
tion, high speed aerators can be an eco
solution to waste water treatment proble
direct high speed aerator is essentially
flow pump with a 360 degree discharge. Th
tor offers substantial improvement in des
plicity and ease of application over previ
driven aeration units, resulting in relativ
capital and maintenance costs. Mixing and
transfer efficiency are a function of prope
The oxygen transfer and mixing are acco
by raising the pumped liquid to a relativ
kinetic energy state andthen impinging
surface of the basin at a sufficiently flat
that the energy is efficiently transferre
body of liquid surrounding the unit. Pa
significant internal pump design characte
clude inlet and exit hydraulic configura
peller design, and operation speed. All oth
being equal, the aerator which uses a low
motor, larger discharge volute diameter
greater number of blades on the impel
higher capacity and be more efficient In

good mechanical and hydraulic design, the unit ust be applied in such a manner as to maximize performance in a given waste treatment system. xamples of a proper design configurations are ven. Baffles may be installed to assist the mixing completely mixed reactive vessels. (Orr-FIRL)
76-03692

ORMATION OF ORGANOCHLORINE COMOUNDS FROM THE CHLORINATION OF A UNICIPAL SECONDARY EFFLUENT,
orth Texas State Univ., Denton. Inst. for Environmental Studies.
H. Glaze, and J. E. Henderson, IV.
urnal Water Pollution Control Federation, Vol No 10, p 2511-2515, October, 1975. 3 fig, 1 tab, ef.

scriptors: *Chlorination, *Organic compounds, Vaste water treatment, *Effluents, Sewage treatnt, Analytical techniques, Water analysis, boratory tests, Public health, Pollutant identifiion, Gas chromatography.
ntifiers: Superchlorination, Organochlorine npounds.

e use of 'superchlorination', or using a much ger chlorine dosage than usually required for cialty applications, of waste waters or waste ducts was found to yield significant quantities new chlorinated organics. There has been a at deal of concern about the possible deleteri- effects of such compounds on receiving eams and on chronic health effects should such npounds enter potable water supplies. In a oratory investigation, grab samples from a vage treatment plant were collected and treated h a chlorine dose of 1500 mg/liter. Chlorinated l control waste water extracts were analyzed by chromatography. Most of the compounds ntified were aromatic derivatives. A qualita--quantitative analysis of the chlorinated orics found in the waste water effluent was sented in a table. Concentrations of the comnds (in the microgram per liter range) agreed h previous research in this area. Further work progress to determine if any of the chlorinated tone derivatives found might be precursors of oroform. Other research is underway, using rocoulometric methods to determine the total anic-bound chlorine content in chlorinated ondary effluent. (Kramer-FIRL)
6-03699

ACE ELEMENTS IN BIOLOGICAL WASTE EATMENT WITH SPECIFIC REFERENCE THE ACTIVATED SLUDGE PROCESS,
fornia Univ., Davis.
. Wood, and G. Tchobanoglous.
Proceedings of the 29th Industrial Waste Conence, May 7-9, 1974, Part 2, Lafayette, Indiana, due University, p 648-661. 4 fig, 6 tab, 21 ref.

criptors: *Trace elements, *Biological treatt, *Waste treatment, *Activated sludge, ste water treatment, Microorganisms, islation, Domestic wastes, Industrial wastes, estic water, Enzymes, Growth rates, abolism, Bacteria, Treatment facilities, Sur- runoff, Adsorption, Chelation, Chemical ipitation.
tifiers: Complete-mix activated sludge ess, Sacramento County(Calif), Municipal orces, Sewer infiltration.

significance of trace elements in biological e treatment is discussed, with specific rence to the activated sludge process. The role ace elements in waste water is reviewed. They required for the growth and metabolism of oorganisms. Microbial growth can be ced by controlling their concentrations. It has been possible to establish the specific trace ent requirements of microbial populations in e water treatment processes. Trace elements d in waste water depend on their source and the removal mechanisms in the waste stream. The most significant source is domestic water supply. The requirements of municipal ordinances limit the contributions of domestic additions and industrial discharges. Other sources include surface runoff and sewer infiltration. Removal mechanisms include adsorption, hydroxide precipitation, hydrogen sulfide precipitation and chelation. In the activated sludge process it was found that the following requirements of trace elements must be met: trace elements needed to activate enzymes responsible for degrading the waste must be present; those responsible for growth and metabolism must be present; their concentrations must be in balance with that of the wastes; and, the concentration must be high enough for cells to concentrate and use them. A study conducted on the Sacramento County complete-mix activated sludge process is discussed. Results show that deficiencies of certain trace elements can be a factor in producing the proper types of bacteria essential for waste treatment. These elements must be considered in designing new treatment systems. (Pinto-FIRL)
W76-03700

OZONATION OF WATER: ROLE OF HYDROXYL RADICALS AS OXIDIZING INTERMEDIATES,
Eidegenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5F.
W76-03703

CHECK THAT PH,
Fisher Controls Co., Marshalltown, Iowa.
C. Cho.
Water and Wastes Engineering, Vol 12, No 10, p 70-71, October, 1975. 8 fig.

Descriptors: *Waste water treatment, *Neutralization, Equipment, *Hydrogen ion concentration, Mixing, Acidity, Alkalinity, Acid-base equilibriums, Control systems, Control, Analytical techniques.

Controlling pH is one of the most important operations in any waste water treatment process. However, control of alkalinity or acidity is difficult because pH is a nonlinear function of the proportions of components in a solution, and extremely high gain occurs near the neutral point. Titration curves are illustrated that show the effects of neutralizing agents on acids and bases. These curves are the basis for pH control system design and must be defined for each application. Another problem with pH control is that the process usually involves mixing large quantities causing long time constants. The lags can be minimized by using small tanks to reduce transport delays and permit good mixing. However, the tank must be sufficiently large so that hold-up is long enough to allow the reaction to be completed. If fluctuations around the desired point can be tolerated, then on-off control systems can be effective. Simple feedback loops based on specially-designed nonlinear pH controllers are satisfactory for most applications. The controllers are proportional-integral-derivative elements. If the controller is set to correspond with the steeply sloped titration curve, then the net open-loop gain of the controller and process is essentially made linear. An example of a simple continuous pH control system is schematically illustrated. (Orr-FIRL)
W76-03704

ROTATING BIOLOGICAL REACTORS REMOVE NUTRIENTS, PART I,
SIECO, Inc., Columbus, Ind.
O. Hao, and G. F. Hendricks.
Water and Sewage Works, Vol 122, No 10, p 70-73, October, 1975. 3 fig, 3 tab.

Descriptors: *Waste water treatment, *Pilot plants, *Biological treatment, Biochemical oxygen demand, Suspended solids, Treatment facilities.
Identifiers: *Biological rotating discs.

A pilot plant study conducted at the Columbus, Indiana, sewage treatment plant, demonstrated that rotating biological reactors can efficiently remove BOD, suspended solids (SS), and ammonia nitrogen from waste water. A full-scale plant was designed based on the results of this pilot study. The pilot bio-disc unit consisted of a 24-in module containing 36 bio-discs with a total media surface area of 250 sq ft arranged in four stages. The results of the pilot test are presented. BOD removal, generally effective and improved by chemical addition, was adversely affected by direct chemical addition on the bio-disc fourth stage tank, waste activated sludge from the primary clarifiers, and rotating speeds greater than 8 rpm. The BOD removal efficiencies were independent of the influent BOD concentrations. Suspended solids were removed effectively by the system when ferric chloride was added. Suspended solids removal was affected by the same factors as BOD removal. (See also W76-03713) (Orr-FIRL)
W76-03712

ROTATING BIOLOGICAL REACTORS REMOVE NUTRIENTS, PART II,
SIECO, Inc., Columbus, Ind.
O. Hao, and G. F. Hendricks.
Water and Sewage Works, Vol 122, No 11, p 48-50, November, 1975. 7 fig, 2 ref.

Descriptors: *Waste water treatment, *Pilot plants, Phosphorus, Nitrogen, Ammonia, Nutrient removal, Treatment facilities, Nitrification, Denitrification, Sewage treatment, *Biological treatment.
Identifiers: *Rotating biological discs.

A pilot plant study conducted at the Columbus, Indiana, sewage treatment plant demonstrated that rotating biological reactors can efficiently remove BOD, suspended solids (SS), and ammonia nitrogen from waste water. A full-scale plant was designed based on the results of the pilot study. BOD, SS, ammonia nitrogen, and phosphate removals with the addition of alum, or ferric chloride were examined. Phosphate removal increased by adding alum directly to the fourth stage of the rotating disc; however, this adversely affected BOD and SS removals. The selected alum concentration was 100 mg/liter; optimum polymer dosage to complement this alum dosage was 0.25 to 0.75 mg/liter. Total nitrogen removal could not be balanced due to the lack of Kjeldahl nitrogen analysis. Therefore, the extent of nitrification and denitrification could not be determined. The ammonia nitrogen removal results were excellent. (See also W76-03712) (Orr-FIRL)
W76-03713

WASTEWATER TREATMENT WORLDWIDE,
Victorian Water Commission, melbourne (Australia).
R. W. G. Evans.
Australian Chemical Engineering, Vol 16, No 7, p 5-7, July, 1975.

Descriptors: *Waste water treatment, *Sewage treatment, *Reviews, *Equipment, Rivers, Effluents, Demineralization, Ozone, Chlorination, Activated sludge, Dissolved oxygen, Municipal wastes, Filtration, Biological treatment.
Identifiers: Physico-chemical treatment.

A review of new waste water treatment technologies in various countries is presented. In Singapore, an island republic, a very sophisticated pilot plant for physico-chemical treatment has been designed which will treat raw sewage for direct reuse. The process includes lime treatment and ammonia stripping, filtration, carbon adsorp-

tion, demineralization, ozonization, and chlorination. In Great Britain, the trend has been to replace small treatment facilities with larger regional plants which serve more than 100,000 persons. Effluent from inland sewage treatment works is usually discharged to watercourses which supply water to downstream users. Thus, standards for nitrates, BOD, and suspended solids have become quite stringent. In the Ruhr area of Germany, rivers are managed on a catchment basis with dissolved oxygen being an important parameter. Sewerage systems in Switzerland are operated by municipalities; plant use either activated sludge, biological filtration or just primary screening and sedimentation. In Holland, sewage treatment standards are based on achieving dissolved oxygen in the effluent. Biological treatment with two stage high rate filters is common. In Australia, differing climatic, financial, legislative, and political conditions apply for the various parts of the country. The most frequently used methods of treatment include Imhoff tanks with low rate trickling filters, stabilization lagoons, separate sedimentation and sludge digestion with high rate filtration, and activated sludge plants. (Kramer-FIRL)
W76-03714

STUDIES ON THE ADSORPTIVE EFFECT OF ACTIVATED CHARCOAL ON POLYCHLORINATED BIPHENYLS IN WATER (YOZON PCB NO KASEITAN KYUCHAKU SHORI NI KANSURU KENKYU),
For primary bibliographic entry see Field 5F.
W76-03715

NEW PLANT SOLVES SEASONAL PROBLEM,
Kupper (Charles J.), Inc., Piscataway, N. J.
H. S. Allen, and D. R. Flett.
Water and Wastes Engineering, Vol 12, No 10, p 23-25, October, 1975. 1 fig.

Descriptors: *Sewage treatment, *Ozone, *Control systems, Computers, Sludge treatment, Treatment facilities, *Waste water treatment, Digestion tanks, Odor, New Jersey, Seasonal.

Problems due to seasonal variations in sewage flow at a secondary treatment plant at Ortley Beach, New Jersey, were solved by a combination of ozone and automation. The treatment facility, located close to homes in a recreational community, was expanded from its 6 mgd primary capacity to a 12 mgd secondary capacity. Main components of the new system are a main influent pump station with mechanical bar screens and grinders. Sludge production in winter is about 60% of the summer load. The secondary digester is used as a holding tank, allowing the final step in sludge treatment (vacuum filtration) to proceed at a constant rate. Following digestion, air from primary, aeration, and sludge thickening tanks is fed to an ozone building for odor control treatment. Two ozone generators each produce 17 lbs ozone per day. Operations of the treatment process are monitored by an analog computer system which also provides data on the plant operation. (Kramer-FIRL)
W76-03716

WASHINGTON SEWAGE WORKS: DESIGN AND OPERATION,
Washington Development Corp., New Town of Washington (England).
J. M. Eno, and D. C. Pollington.
Water Pollution Control, Vol 74, No 5, p 571-583, 1975. 3 fig, 8 tab, 10 ref.

Descriptors: *Operation and maintenance, *Treatment facilities, Sewage disposal, *Sewage treatment, Storm water, Flowmeters, Suspended solids, *Waste water treatment, Waste water disposal, Sludge treatment, Sludge disposal, Sedimentation, Detritus, Pumping, Domestic wastes, Industrial wastes, Metals, Cost analysis.
Identifiers: New Town of Washington(Great Britain), River Wear(Great Britain), Detritor, Comminutor, Colliery.

The New Town of Washington (Great Britain) was designated in 1964. The development, design and operation of the sewage treatment works is discussed. Prior to the planning of the new town, sewage, mostly domestic but some industrial, was dumped virtually untreated into the River Wear. The new Northumbarian River Authority imposed treatment standards that were compatible with light industry. Wide variations in the flow rates along with the presence of high suspended solid concentrations from a coal washing plant caused initial problems. During Stage I development, two communitors and one detritor were installed to control the suspended solids. Two twin side-weir storm-sewage overflows, a new flow metering system and three twin rectangular primary sedimentation tanks were added to handle the flow variations. Sewage sampling over the years indicates that the strength of the sewage is decreasing, mainly because of the increase in modern housing. A temporary pumping station was built for sludge disposal. Cost analyses were performed on various sludge disposal methods. A tanker was purchased and the sludge was temporarily transported to sea. Sea disposal through pipes was most likely to be adopted. Industrial waste waters contained grit from the colliery, cyanide, phenol, and various metals including iron, copper, chromium, nickel and zinc. Industrial effluents were controlled by the consent procedure. In Stage II development, increased population made secondary treatment necessary. Two aeration units and four final settling tanks were added and the flow apparatus was automated. A central processor is used for continuous surveillance, data recording and plant control. (Pinto-FIRL)
W76-03717

FREEWAY STORM RUNOFF WILL BE CLARIFIED,
Michigan Dept. of State Highways, and Transportation, Lansing.
M. Rothstein.
Public Works, Vol 106, No 11, p 65, November, 1975.

Descriptors: *Storm runoff, *Highway effects, *Lakes, Water pollution sources, Oil wastes, *Waste water treatment, Separation techniques, Pumps, Michigan.

A special outlet extending 2000 feet into Lake St. Clair, Michigan, has been installed to collect surface drainage from an interstate highway. Before entering the underwater discharge line, silt, debris and oil wastes washed from the highway will be prevented from polluting the lake by passing into a 778.5-ft long settling and skimming chamber. Storm water runoff from the highway will be delivered by a 102-inch runnel sewer to a pumphouse adjacent to the stream end of the chamber. Discharge from the settling and skimming chamber is by a 14-ft diameter drop shaft connected to the tunnel sewer. The chamber, 42 ft long and 12 ft deep, has sluice gates on the discharge end of each side to provide additional flow control. The downstream end of each chamber has a weir to maintain a constant water level. Floating oil retainers and a baffle retain surface oils. these are removed by a floating oil skimmer at a rate of 480 gal/hr. Normally, downstream gates will be closed and flow into the chamber will be at a low rate to allow oils to rise to the surface and become trapped by the baffle. In the event of a major oil spill at low flow, the pumphouse would shut off and oil would be pumped into the sluiceway for removal by pump trucks. If an oil spill occurred during a storm, oil would be trapped in the large chamber of the downstream end and be removed by two skimmer units into a 200-gallon tank. (Kramer-FIRL)
W76-03718

THICKENING OF COAGULANT AIDED PRIMARY WASTEWATER SLUDGES,
J. W. Oliver.
Available from University Microfilms Inc., An Arbor, Mich. 48106. Order No. 75-21, 475. PhI Thesis, 1975, 356 p.

Descriptors: *Waste water treatment, *Sludg treatment, *Laboratory tests, Analytic techniques, Sedimentation, Sludge disposa Coagulation, Research.
Identifiers: *Gravity thickening, Solids flux anal sis.

Research was conducted on the design of gravi thickeners for coagulant aided primary sludge Laboratory tests were performed using solids fl analysis and the Yoshioka graphical solutio Results indicated that an impact on the settli velocity and limiting solids flux were produced column diameter, initial sludge height, initial soli concentration, slow stirring, aging and shearin and sludge type. The major laboratory syste variables were evaluated separately for ea sludge type. Settling velocity data for all sludg followed a power function relationship, with a b tom filling procedure being the most effective assuring a completely uniform initial solids c centration. All the coagulant aided primary sludg were determined to be compressible and non-id in nature. It was recommended that full-sc thickener operation tests be conducted for co parison with these laboratory results. (Kram FIRL)
W76-03720

CURRENT TRENDS IN PACKAGED WAST WATER TREATMENT FACILITIES, PART II
New Jersey Inst. of Tech. Trenton. Dept. of C and Environmental Engineering.
R. Dresnack, and W. Miller.
Water and Sewage Works, Vol 122, No 10, p 101, October, 1975. 4 fig.

Descriptors: *Activated carbon, *Coagulati *Biological treatment, *Waste water treatm *Sewage treatment, Treatment facilities, Op tion, Maintenance, Design criteria, Biochem oxygen demand, Suspended solids, Monitor Equipment.
Identifiers: Physico-chemical treatment, Che cal-biological treatment, Chemical treatm Package plants.

As the third part of a series on packaged w water treatment plants, this paper discu process variations, performance data, and s tion criteria. A unit was designed by Zurn In tries, Incorporated, for physico-chemical t ment using activated carbon and alum coagul combined with chlorination and sand filtratio flow diagram and layout plan for this process illustrated. A flow diagram for a chemical-bio cal treatment plant designed by Environment Corporation was also provided. The second operated on a modified batch process whe waste water is accumulated and continu aerated until a complete tank has been acc lated. The fresh water is then diverted out o raactor vessel and the vessel becomes a sedi tation basin where organic polymer is a Rapid sedimentation occurs as a product of bi ical stabilization, chemical flocculation, quiescent settling conditions. Additionally, o tional problems in package plants were outl These included mud (due to storm flow), from blowers or motors, scum formation whe much air is being used, and odors. Perform data were presented for a Tex-A-Robic extr aeration package treatment plant in Watc New Jersey, including yearly fluctuation of and suspended solids. It was found that alt effluent quality was better than it had for been with septic tanks, better operation, tenance, and monitoring of equipment and would produce a cleaner effluent. (See also 00272) (Kramer-FIRL)
W76-03788

EAVY METAL RELEASE BY CHLORINE OX-ATION OF SLUDGES,
n Note-Harvey Associates, Blacksburg, Va.
W. Oliver, W. C. Kreye, and P. H. King.
ırnal Water Pollution Control Federation, Vol No 10, p 2490-2497, October, 1975. 5 fig, 6 tab, ref.

scriptors: *Sludge treatment, *Municipal stes, *Industrail wastes, *Heavy metals, ater reuse, Recycling, Treatment facilities, aste water treatment, Chlorination, Dewater-, Sludge digestion, Laboratory tests.
ntifiers: Chlorination oxidation, Sludge orination, Filtrates, Municipal-industrial stes.

orine oxidation of sludge from the treatment of nbined municipal-industrial wastes was earched. Quantitative analysis was performed heavy metal release from various sludge in a oratory chlorine oxidation process and in a full-e operating unit. The chlorine oxidation cess is an alternative to anaerobic digestion. ults indicated that (quantitatively) the release eavy metals from sludge is stabilized by using chlorine oxidation method. The optimum stion procedure for determining the heavy al content of sludge was HNO3-HC1 double stion for six hours. The release of such metals n sludges (consisting of primary plus activated ickling filter humus and anaerobic) was found e a function of the final pH of the sludge after rine oxidation, the type of sludge oxidized, the species of metals present in the sludge. ause the filtrate from chlorine oxidation is lly recycled to the influent of a waste water tment plant, detrimental effects may result the heavy metals. In addition, COD, pH, rides, phosphorus, and chloramines found in iltrate should be evaluated. It was suggested pH adjustment should be practiced following rine oxidation and before the final dewatering der that the filtrate returned to the treatment be less harmful to the facility. (Kramer-L)
-03789

OTCH WEIR AIDS IN METERING ATED EFFLUENTS,
tz (J.R.) Associates, Tampa, Fla.
rimary bibliographic entry see Field 5A.
03790

DISPERSED FLOW MODEL FOR A OGICAL REACTOR AS APPLIED TO THE IVATED SLUDGE PROCESS,
use Univ., N.Y. Dept. of Chemical Engineer-d Materials Science.
Turian, G. E. Fox, and P. A. Rice.
Canadian Journal of Chemical Engineering, 3, No 4, p 431-437, August, 1975. 9 fig, 3 tab, .

riptors: *Activated sludge, *Kinetics, *Model s, Mathematical models, *Waste water treat-Mixing, Biomass, Growth rates, Organic g, Sewage treatment, Biochemical oxygen nd.
fiers: Shock loads.

xial dispersion model of Levenspiel is the vailable model for describing mixing in a ntional activated sludge aeration basin. iningthis mixing model with a suitable ex-on for waste removal kinetics provides a ption of the activated sludge process. The ons presented are applied to the analysis of tivated sludge process. BOD and biomass s are calculated for activated sludge reac-sing Monod kinetics and assuming that parameters are uniform over the length of nk. Plug flow or complete mixing are con-d as limiting cases of the overall model. Ap-nate perturbation solutions are calculated se two limiting situations. The perturbation solutions are compared with the solutions of numerically integrated equations over a range of parameters corresponding to real activated sludge systems. Smaller values of the dispersion number result in larger BOD removals. As the dispersion number decreases, the steepness of the increase in the biomass concentration increases, and the shape of concentration vs. reactor length profiles is increasingly dependent on the saturation constant. Dispersion number values greater than one are desirable to prevent upsets in activated sludge tanks resulting from shock loading. Activated sludge operation is more stable at higher values of the dispersion number because the tank conditions are more uniform and less affected by changes in the feed stream. (Orr-FIRL)
W76-03793

APPLICATION OF KINETIC MODELS TO THE CONTROL OF ACTIVATED SLUDGE PROCESSES,
T. W. Keyes, and T. Asano.
Journal of Water Pollution Control Federation, Vol 47, No 11, p 2574-2585, November, 1975. 9 fig, 6 tab, 13 ref.

Descriptors: *Activated sludge, *Kinetics, *Model studies, *Waste water treatment, Treatment facilities, Control systems, Mathematical models, Biomass, Biochemical oxygen demand, Suspended solids, Flow rates, Sewage treatment, Montana.
Identifiers: Sludge age, Bozeman(Mont).

Mathematical models are convenient to use to describe the kinetics of activated sludge processes. Applicable kinetic models are presented which were used for operational modifications of the City of Bozeman, Montana, Wastewater Treatment Plant. The study determined the average waste water loadings and activated sludge plant performance from August through December, 1973, and the feasibility of increasing the waste water flow rate to the activated sludge system without degrading the final clarifier effluent quality. Process modifications, based on the analysis, were implemented in June and July of 1974. The mean cell residence time is an important factor in the control of activated sludge process performance. A higher BOD5 removal was achieved by reducing cell residence time, thereby producing a younger, more active biomass in the aerator. The change in the sludge age must be balanced out with the secondary clarifier performance and the optimum combiation of BOD5 removal in the aerator and the clarifier sludge settleability. Based on the kinetic models employed, it was decided that the waste water flow rate to the activated sludge system should be increased from 1.1 to 2.1 mgd. The increased loadings had a beneficial effect on the effluent TSS concentrations. The reduction in TSS increased form 65% to 75%. The kinetic models permitted the institution of near full capacity conditions at the Bozeman facility. (Orr-FIRL)
W76-03794

PROCESS CONTROL AS AN AID TO POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W76-03795

DYNAMICS OF NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS,
Tennessee Eastman Co., Kingsport.
For primary bibliographic entry see Field 5B.
W76-03797

MULTI-PROCESS BIOLOGICAL TREATMENT MODEL,
CH2M Hill, Bellevue, Wash.
D. R. Christensen, and P. L. McCarthy.
Journal Water Pollution Control Federation, Vol 47, No 11, p 2652-2664, November, 1974. 2 fig, 7 tab, 9 ref.

Descriptors: *Biological treatment, *Mathematical models, *Computers, *Kinetics, Activated sludge, Aeration, Nitrification, Dentrification, Aerobic digestion, Anaerobic digestion, Waste water treatment, Mixing, Energy.
Identifiers: *BIOTREAT, Stoichiometry, Aerated lagoons, Sulfate reduction.

A computerized biological treatment model, BIOTREAT, in Fortran IV language, uses stoichiometry, thermodynamics, and kinetics for the study of a number of biological processes in suspended growth in a complete mix reactor. It is primarily concerned with activated sludge, aerated lagoons, nitrification, dentrification, sulfate reduction, anaerobic or aerobic digestion, and anaerobic ponds. Sludge yields, oxygen requirements, nutrient needs, and methane production, which usually have to be input with coefficients, are determined by BIOTREAT from the mass and energy relationships of the compounds involved in the biochemical reactions of the treatment process. The program utilizes a catalog of half-reactions that can be input when a run is made; this allows the modelling of a number of processes. In this manner, the engineer only has to be familiar with one model in order to study a wide variety of treatment applications. A special half-reaction and subroutine are available for modelling with unique organic wastes since all sources of waste cannot be included in the catalog. Furthermore, increasing quantities of information about a process can be input, and more accurate output results will be obtained. (Waltner-FIRL)
W76-03799

A MATHEMATICAL MODEL FOR PHOSPHORUS MOVEMENT IN SOILS,
Michigan State Univ., East Lansing. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-03802

CHEMICAL ENGINEERING AND THE ENVIRONMENT--A REVIEW.
Australian Chemical Engineering, Vol 16, No 6, p 3, 5, 6, June, 1975. 8 ref.

Descriptors: *Water quality control, *Environmental effects, *Sewage treatment, *Air pollution, *Chemical engineering, Recycling, Equipment, Flow meters, Industrial wastes, Oil spills, Legislation, *Reviews.
Identifiers: Australia.

A review is presented of air purification, water treatment, effluent disposal and recycling, and sewage treatment, as they pertain to chemical engineering in Australia. An increased use of smoke emission monitoring systems and air pollution monitoring equipment has been noted. Water pollution control standards are outlined in the Clean Waters Act of 1970, which sets limits that should be achievable by filtration, separation, sedimentation, and chemical treatment methods. Oil contamination is discussed as a common form of water pollution; monitoring devices and methods of cleaning oil spills are detailed. Basic principles of industrial effluent treatment and associated types of equipment are outlined. Sewage treatment is generally accomplished by biological treatment. Most sewage treatment and disposal equipment is now supplied as a complete plant, and many sewage treatment facilities are automatic, employing Vee-notch, magnetic flow meters, venturi tubes, differential flow meters, various measurement equipment, and special pumps for transferring sludges and slurries. It was concluded that chemical engineering will play an important role in identifying and solving environmental problems in Australia and in maintaining environmental quality. (Kramer-FIRL)
W76-03805

EPIDEMIOLOGY OF SALMONELLAE AND FERTILIZING OF GRASSLAND WITH SEWAGE SLUDGE (SALMONELLENEPIDEMIOLOGIE UND GRUENLANDDUENGUNG MIT KLAERSCHLAMM),
For primary bibliographic entry see Field 5C.
W76-03807

SOCIAL AND ECONOMIC DEVELOPMENT CRITERIA IN POTABLE WATER AND SEWERAGE SYSTEMS (CRITERIOS SOCIALES Y ECONOMICOS DE DESSARROLLO EN LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO),
For primary bibliographic entry see Field 5F.
W76-03808

TRUMMER TUBE SCREW PUMP.
For primary bibliographic entry see Field 8C.
W76-03810

INDUSTRIAL AND MUNICIPAL SLUDGE DEWATERING, THE BOEING 'BEST' SYSTEM,
Boeing Aerospace Co., Seattle, Wash. Environmental Protection Systems.
R. K. Ames, H. H. Peters, and R. L. Olson.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Lafayette, Indiana, Purdue University, p 207-212, 6 fig.

Descriptors: *Dewatering, *Municipal wastes, *Industrial wastes, *Sludge treatment, *Waste water treatment, Sludge, Cost comparison, Effluents, Oil, Solubility, Lime.
Identifiers: Boeing Extractive Sludge Treatment(BEST), Aliphatic amine solvents, Reverse solubility, Filter cake.

The Boeing Extractive Sludge Treatment (BEST) process is discussed. Emphasis in the study is placed on industrial sludge. This process uses the unique properties of a family of aliphatic amine solvents to remove water and oil from both organic and inorganic sludges. The products are a dry sludge, clear water effluent and oil that can be used as an energy source or a commercial byproduct. Other advantages included economical operation and lack of environmental impact. The unusual property of this class of solvents is a reverse solubility with temperature characteristic. When these solvents are added to a sludge, and the system is cooled, it becomes a two phase system, with solid particles dissolved in a solution of water, oil, fats and solvent. Solids are removed mechanically. A small temperature increase separates the water from the solvent, oil and fat solution, and the latter is separated by distillation. Theoretical cost comparison of this process with brute force drying of the water shows the BEST process is more economical. The process works well on both municipal and industrial sludges. The process used on a high lime sludge produced 27.2% filter cake and a clear sterile effluent. Used on an oily waste, there was left 35% dried solids and a colorless clear effluent. Further separation gave a water effluent containing 0.1% solvent and no oil. Most of the oil was recovered. The dry filter cake and the effluents were analyzed for their quality. The system was run and discharges analyzed over a period of time to determine optimum operational parameters and to refine system operation economics. (Pinto-FIRL)
W76-03816

PUMPS: APPLICATION AND DESIGN BASICS, PART II,
Clarkson Coll. of Technology, Potsdam, N. Y. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8C.
W76-03819

STUDIES ON PREVENTION OF WATER POLLUTION. IV. EFFECT OF SYNTHETIC DETERGENTS ON WASTE PURIFICATION WITH ACTIVATED SLUDGE PROCESS (SUISHITSU ODAKU BOSHI NI KANSURU KENKYU (DAI PO). HAISUI NO KASSEIODEI SHORI NI OKERU GOSEI SENZAI NO EIKYO NI TSUITE),
Tohoku Coll. of Pharmacy, Sendai (Japan).
For primary bibliographic entry see Field 5C.
W76-03820

POLYMER CONDITIONING OF CHEMICAL SLUDGES,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W76-03822

ANAEROBIC DIGESTION OF SLUDGE, PART I,
Pirnie (Malcolm), Inc., Paramus, N.J.
A. F. Weland, and P. N. Cheremisinoff.
Water and Sewage Works, Vol 122, No 10, p 80-83, October, 1975. 5 fig.

Descriptors: *Sludge treatment, *Anaerobic digestion, Anaerobic conditions, Sludge disposal, *Waste water treatment, Landfill, Methane.

Anaerobic digestion of sludge was discussed. It is impractical to use digestors which double the capital cost and lower the Btu value of sludge if incineration is to be the ultimate disposal method. However, the digestion will continue to be used in small treatment plants and in large cities where land and ocean dumping are available and economical. One of the major assets involved in using digestion is that it takes raw sludge containing noxious materials and produces a basically inert and useful landfill material. Other advantages of digestion are methane production, high organic loading, no oxygen transfer-aerators, reduction of volatiles, no additional nutrients, and low solids production. Disadvantages, aside from maintenance costs, include supernatant treatment, operation difficulties, erratic sludge volume reduction, close process control, need for backup systems, build up of fines in treatment plant, critical growth system, toxic oxygen, need for external heating, expensive tankage and dewatering. Anaerobic digestion consists of two stages. During the first stage, simple organic structures are formed through complex reactions involving anaerobic acid forming bacteria which metabolize solid and dissolved complex matter such as proteins, carbohydrates, fats, and other organic materials. The structures are metabolized through a number of intermediates to produce simple volatile organic acids and important buffering materials. During the second stage, simple volatile acids are metabolized by methane producing bacteria; methane and carbon dioxide are the main end products. (Waltner-FIRL)
W76-03827

ENVIRONMENTAL EFFECTS OF ADVANCED WASTEWATER TREATMENT AT SOUTH LAKE TAHOE,
California Regional Water Quality Control Board, South Lake Tahoe. Lahonton Region.
D. C. Antonucci, and F. D. Schaumburg.
Journal Water Pollution Control Federation, Vol 47, No 11, p 2694-2701, November, 1975. 2 fig, 5 tab, 7 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Tertiary treatment, *Environmental effects, Energy, Pollution abatement, California.
Identifiers: Secondary pollution.

The results of an assessment of direct and indirect energy requirements and environmental impacts associated with the operation of the full-scale advanced waste water treatment plant at South Lake Tahoe, California, are reviewed. Although the installation effectively removes organic material and nutrients from domestic waste water, requires large amounts of energy and treatmer chemicals. A number of contaminants are release on land and in the air. It is impossible to tel despite quantitative data on energy and materia consumption and on contaminant emissions, if a vanced waste treatment processes significant reduce the net level of degradation in the total e vironment. A common denominator should found with which different types and quantities pollutants released in the environment could quantitatively compared. (Waltner-FIRL)
W76-03828

NEERI ACCEPTS CHALLENGE TO REDUC POLLUTION.
Indian Chemical Journal, Vol 10, No 1, p 13, Ju 1975.

Descriptors: *Water pollution control, *Forei research, *Waste water treatment, Sewage tre ment, Industrial wastes, Oxidation lagoons, Ae tion, Fertilizers, Irrigation, Legislation.
Identifiers: *India.

The National Environmental Engineer Research Institute (NEERI), Nagpur, India, devised methods of treating industrial wastes sewage which are inexpensive and unconventio but effective. The methods reduce capital costs to 80% and reduce operating costs up to 90%. methods take advantage of the sunshine and wa climate of India which favor the treatment wastes in oxidation or stabilization ponds. Was are stored in large well-defined shallow ponds several days while algae and bacteria digest the ganic wastes. The waste water is then suitable irrigation. Oxidation ditches with exten mechanical aeration are recommended for n sized towns because they require less surface than oxidation ponds. Sewage treatment for t towns can pay for itself by providing irriga water that contains all the essential nutri (nitrogen, phosphorus, and potassium) for us fertilizer. The reuse of sewage effluents for in trial purposes is also being instigated in large c such as Bombay. The Central Board was cre under the Prevention and Control of Pollution which was enacted in 1974. This board promote the cleanliness of streams and wells provide technical assistance and guidance to S Boards and sponsor investigaions and rese relating to problems of water pollution. Legisla is being studied which will tax the major indus contributors to water pollution. (Orr-FIRL)
W76-03831

RESEARCH NEEDS IN THE CONTEXT OUR GOAL TO RESTORE AND MAINT THE CHEMICAL, PHYSICAL, AND BIOL CAL INTEGRITY OF THE NATION'S WAT
National Science Foundation, Washington, Div. of Advanced Environmental Research Technology.
For primary bibliographic entry see Field 5G.
W76-03832

ZERO DISCHARGE OF INDUSTRIAL WA WATERS,
Environmental Protection Agency, Washin D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W76-03834

WASTE WATER RENOVATION AND RE STATE OF THE ART,
Clemson Univ., S. C. Dept. of Environ Systems Engineering.
T. M. Keinath.
In: Ultimate Disposal of Wastewaters and Residuals, April 26-27, 1973, Raleigh, Carolina, Research Triangle Universities, p 3 tab, 8 ref.

scriptors: *Waste water treatment, *Municipal stes, *Water reuse, Public health, Treatment ilities, Coagulation, Adsorption, Filtration, Ion hange, Nitrogen, Reverse osmosis, Reclaimed ier, Reviews.
ntifiers: Public opinion.

e state-of-the-art of the renovation of municipal ste water for the reuse of such waters as a via- water resource is discussed. The four basic as that this discussion covers are: the public's tude toward the reuse of renovated municipal ste water; the specific health considerations; primary reclamation processes; and, the ex- ences of a reclamation facility in renovating te waters for reuse. A public attitude survey sponsored by the University of California at keley and the California State Department of lic Health to determine how the public would ond to the concept of reusing municipal waste ers. The consensus was that proposals to im- nent the reuse of renovated municipal waste ers would not meet with serious opposition as as the proposals are properly introduced. The th aspects of reusing municipal waste water in- e bacteriology, virology, algology, parisitolo- and toxicology. The treatment processes that capable of high degree of treatment required reuse purposes are those that were developed er the supervision of the Advanced Waste tment Program of the Environmental Protec- Agency. These treatment methods include gulation, adsorption, filtration, ion exchange, gen removal, and reverse oxmo- ltrafiltration. Operation of the South Lake e, California, reclamation facility is ssed. (Orr-FIRL)
-03836

STES RECYCLING BEFORE FINAL WASTE POSAL,
eral Electric Co., Schenectady, N.Y. Environ- al Protection Operation.
Phillips.
Ultimate Disposal of Wastewaters and Their duals, April 26-27, 1973, Raleigh, North lina, Research Triangle Universities, p 82-86.

riptors: *Waste water treatment, *Recycling, ustrial wastes, Waste water disposal, Waste sal, Incineration, Ultimate disposal, ning, Water pollution, Air pollution, Solid es, Pollution abatement.
ifiers: Waste recovery, *Waste recycling, e reclamation, Zero discharge.

natives to industrial waste water treatment iscussed. Alternatives such as waste recovery ncineration are means of reaching the 1985 discharge goal. Within the General Electric any, waste recovery is emphasized as a daily saving measure and standard operation dure. Copper is reclaimed at a rate of $14 n dollars per year. A plant in Hendersonville, Carolina, resmelts 200 tons of aluminum per h for internal use, and another plant in ville, Kentucky, converts 150,000 tons/year eel punching into cast iron. Incineration is dered as one method of ultimate disposal, ially in situations where toxic chemicals be disposed of. Incineration presents a trade- tuation between how much air pollution will rmitted vs. the contents of the scrubber , and between the amount incinerated vs. the nt landfilled. When designing waste water nent systems the following steps must be in- d: bring management into the picture includ- fety, water pollution, air pollution, noise pol- , and solid wastes; and, consider alternatives d-of-the-pipe treatment. Some case histories ernatives to end-of-the-pipe treatment are nted. (Orr-FIRL)
03838

MATE DISPOSAL OF WASTEWATERS,
onmental Protection Agency, Washington, Office of Research and Monitoring.

For primary bibliographic entry see Field 5E.
W76-03841

SLUDGE HANDLING AND DISPOSAL--STATE OF THE ART,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W76-03842

SLUDGE RECYCLING: THE WINSTON-SALEM EXPERIENCE,
For primary bibliographic entry see Field 5E.
W76-03843

THE EFFECT OF INCINERATION ON METALS, PESTICIDES, AND POLYCHLORINATED BIPHENYLS IN SEWAGE SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Lab.
J. B. Farrell, and B. V. Salotto.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 186-198. 2 fig, 5 tab, 6 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Industrial wastes, *Pesticides, *Polychlorinated biphenyls, Heavy metals, *Metals, Sludge, Incineration, Waste disposal, Mercury.

A study was conducted by the Ultimate Disposal Research Program, Advanced Waste Treatment Laboratory, at the National Environmental Research Center, Cincinnati, Ohio, to establish the concentration of hazardous materials in sludge, and to determine the fate of these substances upon incineration. Sludge samples were obtained from sewage treatment plants where sludge was being incinerated in multiple-hearth incinerators and fluidized bed incinerators. The sludge, ash, and scrubber water were analyzed for metals, pesticides, and polychlorinated biphenyls (PCB's). There is a wide range of concentrations of pesticides and PCB's in sludge indicating that these compounds could be a minor problem in some cases and a major problem in others. There is no easy way to tell without testing whether a sludge contains a high level. Pesticides and PCB's were not found in the ash or scrubber water. It is infered that these are destroyed by incineration. The concentrations of hazardous metals are considerably higher in sludge than in soil or coal fly ash. The concentration seems to be related to the fraction of the waste which comes from industrial sources. Except for mercury, metals show no serious disproportionation into the particulate phase leaving the incinerator. Mercury is essentially totally vaporized into the stack gases. More investigation on the fate of pesticides, PCB's, and metals upon incineration is needed. (Orr-FIRL)
W76-03845

LAND DISPOSAL: STATE OF THE ART,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 5E.
W76-03849

RECYCLING ALLOWS ZERO WASTE WATER DISCHARGE,
Black, Crow, and Eidsness, Inc., Clearwater, Fla.
For primary bibliographic entry see Field 5E.
W76-03926

RECLAMATION OF HYPERION SECONDARY EFFLUENT BY REVERSE OSMOSIS,
California Univ., Los Angeles. School of Engineering and Applied Science.
M. B. Kim-E, and J. W. McCutchan.

Available from NTIS, Springfield, Va 22161 as PB-249 260, $5.50 in paper copy, $2.25 in microfiche. California Water Resources Center, Desalination Report No 60, UCLA-ENG-7542 June 1975. 116 p, 11 fig, 8 tab, 60 ref.

Descriptors: *Waste water treatment, Effluents, *Desalination, *Reverse osmosis, Membranes, Filters, Filtration, *Disinfection, Cleaning, Surfactants, California, Bacteria.
Identifiers: Roccal solution, Sulfur dioxide gas.

A reverse osmosis unit of 12 tubular cellulose acetate membranes was tested for its performance on the secondary effluent of Hyperion Treatment Plant. In 1974, this effluent had an average of 614 mg/l TDS and 0.6 mg/l oil and grease. In the first part of the experiment a filter of 50 micro pore size was used as the only pretreatment of the wastewater. The fluxes of the individual tubes and their total dissolved solids were measured under a 400 psig pressure at 5 gpm flow rate. Fluxes decreased rapidly (about one-third of the initial values in two weeks) due to particulates and oily substances in the influent. Chemical and bacterial analyses were run on both the influent and product water. The average desalination ratio was 8.74. Next, sulfur dioxide gas and Roccal solution were injected into the influent to determine their effectiveness as disinfectants. More than 200 mg/l SO2 and 100 mg/l Roccal were needed to reduce the coliform count in the brine to < 0.03 mpn/ml with a 30 minute residence time. Cleaning of the membrane tubes was studied. Fluxes were readily restored to 80% of their initial values using BIZ, a non-ionic surfactant, or citric acid. (Snyder-Calif, Davis)
W76-03961

MODEL TO PREDICT THE PERFORMANCE OF FEEDLOT CONTROL FACILITIES AT SPECIFIC OREGON LOCATIONS,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
R. B. Wensink, and J. R. Miner.
Presented at the 1975 Annual Meeting, American Society of Agricultural Engineers, University of California, Davis, June 22-25, 1975, 23 p. 1 fig, 10 tab, 7 ref.

Descriptors: *Farm wastes, *Performance, *Feed lots, *Oregon, Waste storage, Design, Model studies.
Identifiers: Retention basins.

The objectives of this study were to develop a cattle feedlot runoff control model, and to utilize the simulation model to determine relationships between historical climatological data and performance of various runoff retention system designs. The sufficient design method was used to determine the minimum storage volume required to prevent illegal discharges as defined by the DPW Effluent Guidelines. In some locations the use of high capacity irrigation equipment allowed reduction of the storage capacity by over 45 percent when a larger pumping system was specified. In other locations, due to the precipitation pattern, no benefit was obtained by the use of pumping equipment with capacity in excess of 0.10 (10 year-24 house storms). Utilization of the sufficient design technique requires the compilation of weather data for a unique climatological region under consideration. The model is relatively inexpensive to operate and a complete climatological region can be analyzed for less than $20, once the regions climatic data are computerized. (Cameron-East Central)
W76-03971

A SURVEY OF EFFECTS OF ANIMAL WASTES ON STREAM POLLUTION FROM SELECTED DAIRY FARMS,
Clemson Univ., S.C. Dept. of Dairy Science.
For primary bibliographic entry see Field 5B.
W76-03974

CHINO VALLEY SHAKER,
For primary bibliographic entry see Field 5E.
W76-03976

SOLID WASTE HANDLING,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5E.
W76-03977

REVIEW PAPER: ANIMAL WASTES MANAGEMENT AND CHARACTERIZATION,
Utah State Univ., Logan. Div. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-03978

RACEWAYS: EXOTIC SPECIES MOST AFFECTED BY PROPOSED E.P.A. DISCHARGE PERMITS,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 5G.
W76-03980

KEEPING THE FEEDER IN BUSINESS,
Soil Conservation Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5G.
W76-03983

MY WASTE-HANDLING SYSTEM FOR BEEF,
For primary bibliographic entry see Field 5G.
W76-03986

AGRONOMIC CONSIDERATIONS OF ANIMAL WASTE DISPOSAL,
Iowa State Univ., Ames. Cooperative Extension Service.
For primary bibliographic entry see Field 5B.
W76-03987

SUMMARY OF KANSAS' EXPERIENCE WITH LIQUID WASTE SPREADING,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering; and Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W76-03988

OUTDOOR, UNPAVED FEEDLOT MANAGEMENT,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
For primary bibliographic entry see Field 5E.
W76-03989

LIVESTOCK WASTE MANAGEMENT IN A QUALITY ENVIRONMENT,
Illinois Univ. at Urbana-Champaign. Cooperative Extension Service.
D. G. Jedele.
Presented at Proceedings of 1973 Livestock Waste Management Conference, Champaign, Illinois, March 7-8, 1973, Circular 1074, p 1-15, 8 fig, 1 tab.

Descriptors: *Farm wastes, *Treatment facilities, *Feed lots, *Livestock, Agricultural runoff, Liquid wastes, Lagoons, Confinement pens, Solid wastes, *Waste treatment.
Identifiers: *Waste management, Hauling, Gutter flushing, Oxidation ditch, Odor control, Dead animal disposal.

This circular was prepared to assist the livestock producer in assessing the pollution potential of livestock operations and to provide a systematic approach to resolving problems. The circular does not incorporate extensive technical data on buildings manure collection and handling facilities, or equipment. It does delineate the parts of a waste management system, listing alternatives that may be used. Systems for reducing water pollution are described including: (1) Feedlot runoff control for unrestricted space, (2) Feedlot runoff control for restricted space, (3) Liquid manure system -- hauling, (4) Liquid manure system -- lagooning, (5) Liquid manure system -- hauling and lagooning, (6) Gutter flushing in a confinement building, (7) Oxidation ditch in a confinement building and (8) Solid and liquid system for dairy facilities. Suggestions are given for reducing odor. Options for dead animal disposal are discussed. (Merryman-East Central)
W76-03991

APPLICATION OF REVERSE OSMOSIS IN WATER CONSERVATION AND TREATMENT IN THE MOTOR INDUSTRY,
Ames Crosta Mills and Co., Heywood (England).
B. Leightell.
Chemistry and Industry, No. 11, p 437-440, June 1, 1974. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Reverse osmosis, *Membrane processes, Water reuse, Water conservation.
Identifiers: Automobile industry, Metal finishing wastes.

Major pollution problems in the automobile industry result from the large quantities of water used. The processes which use water in metal finishing and machining include: aqueous coolants used in metal cutting operations; electrophoretic painting; metal pickling; and, electroplating. Electroplating produces effluents containing various toxic components such as cyanide, chromium, nickel, zinc, and copper. Both economic and environmental benefits will result if the metals and chemicals can be retrieved and the volume to be disposed can be reduced by the removal of water. One such technology is reverse osmosis, which has been successful in the United States. The benefits as well as the limitations of reverse osmosis are discussed. (Kramer-FIRL)
W76-03992

FLUIDIZED-BED FILTER IN ION-EXCHANGER UNITS (DAS SCHWEBEBETT-FILTER BEI IONENAUSTAUSCHER-ANLAGEN),
A. Berninger.
Galvanotechnik, Vol 65, No 4, p 311-318, 1974. 13 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Ion exchange, Resins, Ions, Metals.
Identifiers: Floating-bed ion exchangers, *Metal finishing wastes.

Floating-bed ion exchangers are used for water preparation, industrial processes, and industrial waste water purification. The ion exchange resin in floating-bed exchangers is placed between two nozzle plates, and the waste water to be purified is passed through it from bottom to top, with regeneration performed from top to bottom. Part of the ion exchange resin is floated by the effluent streaming upward, while the quantity of the suspended resin is determined by such factors as the flow velocity, the viscosity of the effluent, and the properties of the resin. Floating-bed ion exchangers excel by their low pressure loss, reduced reagent expenditure for regeneration, and low rate of ion slip. Floating-bed ion exchangers are regenerated with 4-8% hydrochloric acid and 2-4% sodium hydroxide. Such ion exchangers can be connected in parallel, and can be regenerated automatically. They are suitable for the preparation of desalted and high-purity water used for industrial processes and for the elimination and recovery of chromic acid from electroplating waste waters. They also have use in the selective removal of metals, especially of precious metals including mercury, and in the purification of electroplating effluents. (Takacs-FIRL)
W76-03993

DESIGN AND MODE OF OPERATION SYNTHETIC ORGANIC FLOCCULANTS A THEIR USE IN SOLID/LIQUID SEPARATI IN THE CHEMICAL INDUSTRY AND IN I VIRONMENTAL PROTECTION (AUFBAU U IHRE ANWENDUNG BEI FEST/FLUSS TRENNUNGEN IN DER CHEMISCHEN UND UNWELTSCHUTZ),
J. Reuter.
Chemiker-Zeitung, Vol 98, No 6, p 222-227, 19
6 fig, 12 ref.

Descriptors: *Flocculation, *Polymers, Chem industry, *Waste water treatment, *Indus wastes, *Chemical wastes, Dewatering, Centr gation.
Identifiers: Acrylamide.

The structure, mode of operation and the use non-ionogenic, anionactive and cationactive ganic synthetic flocculants are described. S flocculants are most often based on acrylam Non-ionogenic flocculants can be in the form polyacrylamide; anionactive flocculants usually polymers with alkali or ammonium salt acrylic adid; and cationactive products can modifications of polyethyleneimine, polyca mates, and acrylamide copolymers. Such flo lants act by direct binding or binding through tivation bridges or hydrogen bridges of coll and suspended matter. The dosage is usually l than 0.1 weight percent. Synthetic flocculants used in the chemical industry for the purifica of phosphoric acid obtained by trea phosphates with sulfuric acid by means of a l molecular non-ionogenic flocculant. Uses inc the treatment of tap water by means of aniona polymers, the clarification of black liquor in ti um plants by means of high-molecular cationa products, and the dehardening of brine in production according to the Solvay process. culant polymers are also used for the remov hydroxides and carbonates from waste wat obtained following neutralization. Strongly tionactive products are used for sewage sl treatment to facilitate settling and dehydratio means of filter presses and centrifuges. (Ta FIRL)
W76-03994

BIOLOGICAL WASTE WATER PURIFICA IN A LARGE LACQUER AND PAINT M FACTURING PLANT (BIOLOGISCHE AB SERREINGUNG IN EINEM GROSSBET DER LACK- UND FARBENINDUSTRIE),
E. Knappe.
Farbe und Lack, Vol, 80, No 2, p 103-109, 197

Descriptors: *Biological treatment, *Che wastes, Chemical industry, *Waste water ment, *Industrial wastes, Effluents, Aer Biochemical oxygen demand, Waste dis Treatment facilities, Sludge disposal.
Identifiers: Lacquer and varnish industry wa

The one-stage fully biological waste water ment plant established at the Hiltrup lacque varnish plant of BASF is described. The volume of the sanitary and production eff amounts to 2,250,000 cu m with pH values r from 7.8 to 13.5. The BOD level is between 4 600 mg/liter, and the daily BOD load amou 1,300 kg. The waste water is treated in a 1, m-aeration tank with a rotary aerator. Ure phosphate are added to the waste water aerator to correct the nutrient balance. The load ranges from 0.2 to 0.4 g BOD per gram ganic dry matter per day. After an avera sidence time of 14 to 17 hrs, the BOD v reduced to 2% of the original value. The dioxide formed during the biological trea spontaneously neutralizes the lye present waste water. The excess sludge, dewatere chamber type filter press to a solid content o is suitable for both disposal of sanitary land incineration. (Takacs-FIRL)
W76-03995

EGRATED INDUSTRIAL WASTE WATER EATMENT PROJECT WITH ELEC-OFLOTATION AND REVERSE OSMOSIS TEGRALES INDUSTRIE-ABWASSERPRO-T MIT ELEKTROFLOTATION UND UM-HROSMOSE),
. Roth.
ser-und Energiewirtschaft, Vol 66, No 6, p 195, July, 1974.

criptors: *Reverse osmosis, *Waste water tment, *Metals, Heavy metals, Pilot plants, tment facilities, *Industrial wastes, Floccula-, Polyelectrolytes, Oil wastes.
tifiers: *Electroflotation, Aluminum sulfate.

mbined system of electroflotation and reverse osis units for integrated waste water purifica- and industrial water preparation for SWIS-R was tested on a pilot scale. The waste waters e treated contained heavy metals, cyanides, s, bases, salts, chromates, detergents, oil lsions, solvents, chelates, and emulsifiers. owing detoxification and mixing in a storage , the effluents are treated with aluminum te for flocculation, and the pH value is ad-d. A polyelectrolyte is t then added for better culation, after which the neutralized waste r is subjected to electroflotation for the ration of the floccules formed in the preceding es. The treated water with the sludge removed rther purified by reverse osmosis, using com- spiral modules by Gulf (ROGA module). The fied water is returned into the water cycle. The bined electroflotation and reverse osmosis em was found suitable for this purpose, and results obtained during the pilot tests warrant onstruction of a similar waste water treatment . (Takacs-FIRL)
-03997

OMATOGRAPHIC DETERMINATION OF STITUENTS IN ETHERAL EXTRACTS M INDUSTRIAL WASTE WATERS (DEL STITUENTI L'ESTRATTO ETEREO DI UE INDUSTRIALI),
rimary bibliographic entry see Field 5A.
-03998

IBINED TREATMENT OF DOMESTIC AND C MILL EFFLUENTS,
Farrell, L. R. Heble, and A. G. Steuhser.
r Trade Journal, Vol 158, No 19, p 30-31, May 974.

riptors: *Industrial wastes, *Waste water ment, Pulp and paper industry, *Pulp wastes, estic wastes, Filtration, Biological treatment, , Lime, Chlorine, Biochemical oxygen de-.
ifiers: Biofilters, Extended aeration, bined municipal-industrial wastes.

dy of the joint treatment of domestic waste and neutral sulfate semi-chemical (NSSC) and paper mill wastes was conducted. The purpose of the study was to determine the bility of a joint treatment scheme, which provide a means for regionalization of treat- and economy of scale. A pilot plant was con-ted adjacent to the Harriman Utility Board, man, Tennessee, primary waste water treat- plant as a means of evaluating a variety of ulic and organic loadings under controlled tions. The most effective treatment scheme sted of a biofilter (used as a roughing filter) n extended aeration system. Color reduction accomplished by massive lime and chlorine ons. Disinfection was optimum when am- was mixed with the combined wastes prior lorination. The BOD removal efficiency of iofilter ranged from 3% to 45%; the BOD val efficiency of extended aeration ranged 24% to 98%. (See also W74-06513) (Murphy-)
03999

5E. Ultimate Disposal Of Wastes

STOP LEACHATE PROBLEMS,
Lenard Engineering, Storrs, Conn.
For primary bibliographic entry see Field 5B.
W76-03525

REVIEW OF AMERICAN PUBLIC WORKS ASSOCIATION STUDY OF FACILITIES UTILIZING LAND APPLICATION OF WASTEWATER,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W76-03542

AN EXPERIMENT IN THE EUTROPHICATION OF TERRESTRIAL ECOSYSTEMS WITH SEWAGE: EVIDENCE OF NITRIFICATION IN A LATE SUCCESSIONAL FOREST,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 5C.
W76-03555

IRRIGATION WITH WASTEWATER AT BAKERSFIELD, CALIFORNIA,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 3C.
W76-03556

RECYCLING FOR A PURPOSE -- BUT FOR WHAT PURPOSE. A SOCIOLOGIST'S VIEW,
Central State Univ., Edmond, Okla. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W76-03564

ENVIRONMENTAL SURVEYS OF OPEN-OCEAN DREDGE MATERIAL DISPOSAL SITES,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5B.
W76-03644

FLUIDIZED BED FURNACE HAVING COARSE PARTICLE DISCHARGING DEVICE,
Rheinstalh A.G., Dortmund (West Germany).
E. Albrecht, W. Oepke, and H. Wulfmeier.
United States Patent 3,910,208. Issued October 7, 1975. Official Gazette of the United States Patent Office, Vol 939, No 1, p 133-134, October, 1975. 1 fig.

Descriptors: *Patents, *Incineration, *Sludge treatment, *Sludge disposal, Waste water treatment, Equipment.
Identifiers: *Fluidized bed furnace.

A patent was granted for a fluidized bed furance for dehydrated sludge. The equipment consists of a furnace housing on which the bed is supported. Combustion air is directed upward through the bottom of this housing to reduce the sludge to fine ash. The ash passes out of the furnace with part of the combustion air. Coarse particles are also generated. The equipment is detailed for admitting the sludge material to the combustion chamber. Connected to the fluidized bed furnace is a discharge passage. This passage has a rotatable drum portion with an interior wall; a screw thread extends at the proper angle so that the spacing between successive thread windings is large enough for the largest size particles expected to be formed in the fluidized bed to pass through. A central passage is also located between the threads to permit the passing of smaller sized particles. (Kramer-FIRL)
W76-03661

WASTE SLUDGE TREATMENT WITH PRESSURE FILTRATION,
Passavant Corp., Birmingham, Ala.
For primary bibliographic entry see Field 5D.
W76-03676

DRY SPREADER SOLVES SEWAGE TREATMENT PLANT PROBLEMS.
Publis Works, Vol 122, No 11, p 55, November, 1975.

Descriptors: *Sludge treatment, *Sludge disposal, *Waste disposal, *Waste water treatment, Sewage sludge, Sewage treatment, Treatment facilities, Equipment, Dewatering, Activated sludge, Municipal wastes, Indiana.
Identifiers: *Dry sludge spreader, Land application.

A dry sludge spreader has helped in minimizing sewage treatment plant problems at the Blucher Poole Treatment Plant in Bloomington, Indiana. Sludge handling during bad weather presented a real difficulty, particularly in winter months. A Big Wheels dry sludge unit was acquired by the plant and has made a significant difference in the amount of sludge that can be hauled away. From 1974 to 1975, the monthly number of dry pounds of solids to be removed from the plant increased from 5600 to 300,000. The treatment facility uses a complete mix modification of the activated sludge process and serves a population of 15,000 to 20,000. The sludge is basically domestic sewage sludge, with very little industrial waste and a low metals content. Although the sludge was highly desirable for area farmers, they would not accept sludge coming from dump trucks unless the ground was frozen or dry. Now with the new spreader as a delivery method, sludge may easily be received from a belt loader and spread on cornfields and pastureland during all-weather conditions. (Kramer-FIRL)
W76-03677

FROM LAGOONING TO FARMLAND APPLICATION: THE NEXT STEP IN LIME SLUDGE DISPOSAL,
Northern Illinois Water Corp., Champaign.
For primary bibliographic entry see Field 5D.
W76-03678

INFLUENCE OF TREATED MUNICIPAL WASTE WATER ON GROWTH, FIBER, ACID-SOLUBLE NUCLEOTIDES, PROTEIN, AND AMINO ACID CONTENT IN WHEAT GRAIN,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
A. D. Day, F. A. Taher, and F. R. H. Katterman.
Journal of Environmental Quality, Vol 4, No 2, p 167-169, April-June, 1975. 2 tab, 12 ref.

Descriptors: *Waste water disposal, *Irrigation, Crops, Crop response, Nutrients, Fertilizers, Nitrogen, Phosphorus, Potassium, Agriculture, Activated sludge, Wheat.

Experiments were performed to study the effects of treated municipal waste water and well irrigation water plus commerical inorganic fertilizer on the growth, fiber, acid-soluble nucleotides, protein, and amino acid content in whest grain (Triticum aestivum). The wheat was grown in Comoro sandy loam or Grabe silt loam. Irrigation schemes included: treatment with well water plus suggested amounts of nitrogen (112 kg/ha), phosphorus (35 kg/ha), and potassium (one kg/ha); well water plus N, P, and K from commercial sources in amount equal to those found in waste water; and, waste water from an activated sludge sewage plant containing 224, 73, and 140 kg/ha of N, P, and K, respectively. The average number of heads per unit area and grain yield were higher in plots that received waste water. Average days from planting to maturity, plant height, seeds per head, and seed weight were similar for all three irrigation schemes. Grain from the plants irrigated with waste water contained more total protein, and more alanine, histidine, isoleucine, and proline than did grain produced with well water plus sug-

gested N, P, and K or with well water plus N, P, and K in amounts equal to waste water. Similar amounts of cystine, methionine, and threonine were obtained from grains growth under the three irrigation schemes. Treated municipal waste water is an effective source of irrigation water and plant nutrients for the production of higher quality grain from small grains grown in Comoro sandy loam soil. (Orr-FIRL)
W76-03690

NITRATE NITROGEN DISTRIBUTION IN CORN LAND FOLLOWING APPLICATIONS OF DIGESTED SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5B.
W76-03814

THE CONTROL OF POLLUTION OF GROUNDWATER,
Clyde River Purification Board, Glasgow (Scotland).
For primary bibliographic entry see Field 5G.
W76-03815

REVEGETATING BITUMINOUS STRIP-MINE SPOILS WITH MUNICIPAL WASTEWATER, PART I: GRASS AND LEGUME ESTABLISHMENT,
Pennsylvania State Univ., University Park. Dept. of Forest Hydrology.
B. R. Edgerton, W. E. Sopper, and L. T. Kardos.
Compost Science, Vol 16, No 4, p 20-25, August, 1975. 5 tab, 9 ref.

Descriptors: *Land use, *Waste disposal, *Sewage treatment effluents, *Sewage disposal, Sludge disposal, Mining, Irrigation, Grasses, Legumes, Strip mines, Heavy metals.
Identifiers: Land application, Strip-mine spoil banks.

The problem of revegetating acres of land which had been strip mined was investigated. This portion of the research dealt with the determination of the effects of irrigation with municipal sewage effluent and liquid digested sludge on the germination, survival and growth of a variety of grasses on a strongly acid and highly toxic spoil material. Six lysimeters were filled with strip-mine spoil material; the spoil was seeded with 8 grasses and 8 legumes and treated with effluents at various treatment rates. It was found that applications of municipal sewage effluent and liquid digested sludge did facilitate the establishment and growth of selected grass and legume species on this material. There was no vegetation toxicity problem from the heavy metal concentrations in the effluents or sludge. The grass species had higher yields and greater percent areal cover than the legume species. The best vegetation growth and establishment was found with the application of 2-inches of sludge plus 2-inches of effluent. Overall, the grasses with the greatest dry matter production had the lowest concentrations of toxic metals in the above-ground plant tissues. On the other hand, the legumes with the best yields had some of the highest metal concentrations in their foliage. Results of this research suggest that treated municipal sewage effluent and liquid digested sludge are a valuable resource and can be used to neutralize the site conditions found on strip-mine spoil banks, thus facilitating vegetation. (Kramer-FIRL)
W76-03821

POLYMER CONDITIONING OF CHEMICAL SLUDGES,
Missouri Univ., Columbia. Dept. of Civil Engineering.
J. T. Novak, and J. H. O'Brien.
Journal Water Pollution Control Federation, Vol 47, No 10, p 2397-2410, October, 1975. 19 fig, 1 tab, 15 ref.

Descriptors: *Sludge treatment, *Dewatering, *Polymers, *Polyelectrolytes, *Waste water treatment, Water treatment.
Identifiers: Conditioning, Chemical sludges.

Chemical sludge conditioning is used to alter sludge characteristics so that dewatering process yields can be improved. An evaluation of the influence of polymers and sludge characteristics on polymer selection and dose requirements for conditioning was performed. The sludge characteristics studied include type of sludge (alum, lime, or iron), pH, percentage of solids, specific resistance, filter cake solids, and compressibility. The polyelectrolytes tested varied in the molecular weight, charge, charge distribution, and chemistry of the polymer. Sludge dewatering is improved by the use of high-molecular weight organic polymers which decrease the sludge specific resistance. High-molecular weight organic polymers also increase the sludge compressibility but have negligible effect on filter cake solids concentration. A linear relationship exists between optimal polymer dose and sludge solids concentration. Sludge pH and filter cake solids concentration variations cause differences in dose requirements. The dose requirements have an inverse relationship with polymer molecular weights. Polymers with molecular weights less than 0.000001 are ineffective for chemical sludge conditioning. Selection of polymer also depends on pH. Nonionic to moderate-activity anionic polymers function well between pH 6 and 8.5, while high-activity anionic polymers function well at pH greater than 8.5. Neutral or slightly acidic conditions are best for cationic polymer functioning. (Orr-FIRL)
W76-03822

FATE OF WASTEWATER SLUDGE IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
I. W. Duedall, H. B. O'Connors, and B. Irwin.
Journal Water Pollution Control Federation, Vol 47, No 11, p 2702-2706, November, 1975. 1 fig, 1 tab, 21 ref.

Descriptors: *Sludge disposal, *Waste disposal, New York, Microorganisms, Pollutant identification, Water pollution sources, Organic compounds, Centrifugation, Sedimentation.
Identifiers: *Sludges analysis, *New York Bight.

The impact of dumped sludge in the New York Bight apex is being investigated. The present study reports some values for the total organic carbon (TOC), organic nitrogen, total carbohydrate, and caloric content of dried sludge. It also examined the fate of ocean-dumped sludges on the basis of sludge analyses, some preliminary carbon and nitrogen analyses of sediment from the apex, and recently reported in situ oxygen utilization observations in sediments underlying a sludge disposal area. In-plant waste water sludges were centrifuged to remove the water. The centrifugates were freeze-dried to obtain dry, uncrusted samples. The final sample treatment consisted of homogenizing the freeze-dried samples in a blender. The analysis of dried waste water sludge is presented in a table. When studying the fate of dumped sludge, it is important to note the diffusion of sludge immediately after it has been dumped, the rate of decomposition by pelagic and benthic microorganisms, the rate of sedimentation, and the subsequent sediment accumulation. Results indicated that the majority of particulate organic matter in waste water sludge settles near the dump site and quickly decomposes. This explains why unusually high TOC concentrations were not found in the sediments at or the near the dump site. Cutin, a major sludge component, as well as other organic components, can be metabolized by decomposer microorganisms. The carbon to nitrogen ratios of sediments in the dump water area were low; this indicated that nitrogen was not limiting. (Walter-FIRL)
W76-03825

BURN THAT SLUDGE, INCINERATI ALONG WITH REFUSE MAY ANSWER SO ENERGY QUESTIONS,
Parsons (Ralph M.) Co., Pasadena, Calif. Syst Div.
B. I. Loran.
Water and Wastes Engineering, Vol 12, No 1 65-68, October, 1975. 8 fig, 2 tab.

Descriptors: *Sludge treatment, *Sludge dispo *Incineration, *Solid wastes, Energy, W disposal, Ultimate disposal, Burning.
Identifiers: Pyrolysis, Combined refuse/sludg cineration, Domestic refuse.

Restrictions on ocean disposal and loss of lan space for the disposal of municipal refuse sewage sludge as well as the energy crisis caused municipalities to consider incineration disposal and energy conserving method. Repre tative chemical analyses and heat content refuse and sewage sludge samples are given. energy contained in refuse can be recovered shredding and air classifying by feeding the bustible materials into a coal-burning power as supplementary fuel or by pyrolizing the r to produce low-Btu fuel gas. The extreme dil of aqueous suspensions of sewage sludge c the energy content to be less readily avai Total recovery of the energy requies a numb dewatering steps; the recoverable heat us does not balance the energy necessary fo watering. Combined refuse/sludge combustio been practiced. Refuse in the combined treat supplies the heat necessary to evaporate the so that combustion of the sewage sludge is sustaining. Refuse must be processed (shr and separated into combustible and noncom ble products) before being used as a supplem ry fuel or incinerated with sludge. A mu hearth furnace is recommended for the dispo mixtures of refuse and high solids sludge. If is only a moderate amount of refuse availab combined incineration, then a fluidized be nace should be employed. Several commer available pyrolysis units are discussed. A de flowchart for choosing the correct di method is presented. (Orr-FIRL)
W76-03826

ANAEROBIC DIGESTION OF SLUDGE, I,
Pirnie (Malcolm), Inc., Paramus, N.J.
For primary bibliographic entry see Field 5D
W76-03827

LAND DISPOSAL SITE EXPANDS LIQUID WASTE CONTROL.
Waste Age, Vol 6, No 9, p 46-47, 49-50 tember, 1975. 9 photos.

Descriptors: *Waste water disposal, disposal, *Solid wastes, *Landfills, U disposal, Municipal wastes, Industrial waste

The 226-acre CID (Calumet Industrial D ment) Sanitary Landfill is the largest of sanitary landfills serving the six- metropolitan Chicago area. The site accep nicipal, commercial, industrial, and den wastes. The site is located on an expr system which links Chicago, the far south urbs, and northwestern Indiana, near th Calumet River which allows long distanc transfer of wastes from the Great Lakes served by a rail siding permiting railh reclamation systems. CID originated as a corporation in 1964, and merged into Management, Incorporated in 1971 and permit from the State of Illinois Enviro Protection Agency allows the disposal of p ble and nonputrescible solids, and liquid Water base sludges and other flow flash i wastes are disposed of on the landfill further treatment. Biodegradable mater neutralized in filtration beds, while picklin

chromic acids are treated in the neutralization
er with lime. This treatment creates an inert
lge which is used as interim cover in the land-
A fleet of five tractors and 19 specialized
ter trailers, such as vaccum tankers, stainless
ters, rubber lined tankers and bulk liquid tan-
s are operated by CID. The site is located in a
t deep vein of highly impervious clay soil
ch is ideal for waste containment and cover.
ee shifts work on two faces of the site. While
face is getting its daily cover, the other site is
iving wastes. (Orr-FIRL)
6-03829

E MEANING OF ULTIMATE DISPOSAL,
ional Environmental Research Center, Cincin-
, Ohio. Advanced Water Treatment Research

. Dean.
Ultimate Disposal of Wastewaters and Their
duals, April 26-27, 1973, Raleigh, North
olina, Research Triangle Universities, p 13-21.

criptors: *Waste water disposal, *Waste water
nment, *Ultimate disposal, Municipal wastes,
strial wastes, Pollution abatement, Waste
osal, Drying, Incineration, Solid wastes,
te storage, Reuse, Recycling.

mples of some of the problems associated with
disposal of waste waters are discussed.
lly, ultimate disposal includes processing and
ng wastes where they will not degrade the en-
nment. The main problem is where to place the
es. Industrial wastes can be discharged, sub-
to control by permit after suitable purifica-
they can be evaporated; or they can be
ed, after suitable purification. All three of
e processes leave residuals; it is the disposal
siduals that is the real problem. If the pollu-
in the waste water cannot be sold or a permit
heir discharge to the surface or underground
btained, then they must be put into permanent
ge. A permanent lagoon is a permanent liabili-
d not really a long-term solution due to the
that the lagoons fill up. The wastes for per-
ent storage should be as concentrated as
ble; ideally all of the water will be removed.
ever, the cost of drying must be balanced
st the reduced cost of storage. Wastes can be
erted into useful products only if the costs of
ersion can be justified by the market value of
roducts. The cost of treatment can be greatly
ced by careful segregation of waste streams,
hat the pollutants may be more easily
overed or the cost of drying reduced. (Orr-
)
03833

TES RECYCLING BEFORE FINAL WASTE
OSAL,
ral Electric Co., Schenectady, N.Y. Environ-
al Protection Operation.
rimary bibliographic entry see Field 5D.
03838

MATE DISPOSAL BY MEANS OF DEEP
L INJECTION: A LEGAL VIEW,
nia Polytechnic Inst. and State Univ.,
sburg. Water Resources Research Center.
Cox, and W. R. Walker.
ltimate Disposal of Wastewaters and Their
uals, April 26-27, 1973, Raleigh, North
ina, Research Triangle Universities, p 87-
9 ref.

iptors: *Ultimate disposal, *Liquid wastes,
slation, *Legal aspects, Underground waste
sal, Waste disposal wells, Waste water
sal, Injection wells.

gal aspects of deep well injection for the ul-
disposal of liquid wastes are not well
d. There is no general agreement as to
er injection constitutes ultimate disposal or is actually just storage. Deep well injection can be considered as the final solution to certain liquid waste problems as long as a disposal stratum of low utility exists into which the waste can be injected without harmful effects, and the waste can be permanently confined to this stratum. The potential hazards of underground disposal emphasize the need for regulatory controls. It has traditionally been the responsibility of the states for injection well control. State legislation exists in the form of specific disposal well statutes, general pollution control laws, oil and gas laws, and well water statutes. The legislation covers the general subjects of preliminary exploration, well design and construction, operational controls, monitoring, and well abandonment. The regulations of the Colorado Board of Health are presented as a model of comprehensiveness. Legal disputes could arise from a variety of sources: well failure resulting in contamination of water supplies or damage to other natural resources; the migration of injected materials into the underlying space of adjacent landowners without the occurrence of measurable damage; and, injection-induced seismic activity. The case law that will be used to provide precedent for resolution of legal differences between private parties is very hazy. (Orr-FIRL)
W76-03839

ASSESSING PHYSICAL POTENTIAL FOR DEEP DISPOSAL OF INDUSTRIAL WASTES BY WELLS IN THE SOUTHEASTERN UNITED STATES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Environmental and Urban Systems.
J. E. Hackett, J. Hayman, and S. Lewis.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 104-120. 4 fig, 2 tab, 10 ref.

Descriptors: *Ultimate disposal, *Liquid wastes, *Underground waste disposal, *Feasibility studies, Geologic investigations, Geographical regions, Geological surveys, Waste disposal wells, Injection, Hydrogeology, Hydrologic aspects, Southeast U.S.

A study was conducted of the physical potential for deep well disposal of wastes in the Mid and South Atlantic States. The basic steps in the general procedure for regional assessment include: the identification of geologic, hydrologic, and geochemical criteria for suitable disposal environments; the identification of the regional physical framework in terms of factors relevant to deep well disposal; and, assessing the characteristics of the regional framework in terms of stipulated criteria to determine the relative favorability of various environments with regard to deep disposal. A comprehensive review of the literature identified twenty environmental factors which determine the physical feasibility for deep well disposal. The geologic provinces and subprovinces which constitute the primary physical framework, and regional seismicity patterns which determine tectonic stability are discussed for the Mid and South Atlantic states. Assessment of the physical potential for deep disposal varies according to the type of waste. This study separated brines, liquid industrial wastes (subdivided into non-acid and acid), and radioactive wastes, including liquid radioactive and radioactive cement slurry. The crystalline Piedmont Province is unfavorable for injection disposal due to the lack of confinement conditions. The most favorable province is the Coastal Plain due to the lateral continuity of stratigraphic units and the opportunity for confinement of disposed wastes. Tectonic activity is a constraining factor in South Carolina. (Orr-FIRL)
W76-03840

ULTIMATE DISPOSAL OF WASTEWATERS,
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
S. M. Greenfield.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 121-126.

Descriptors: *Research and development, *Federal Water Pollution Control Act, Financing, Projects, Technology, Water reuse, Recharge, Irrigation, Reclaimed water.

The Environmental Protection Agency provides financial support for projects for the development of water reuse technology to help meet the goals of the 1972 Federal Water Pollution Control Act. EPA supports the continued development and implementation of waste water reclamation, reuse, recycling, and recharge. Emphasis is placed on the potential for waste water reuse in agricultural, industrial, municipal, recreational, and groundwater recharge applications. The direct interconnection of waste water reclamation plants with municipal water treatment plants, and projects including procedures for the rapid identification and removal of viruses and organics, epidemiological and toxicological analyses, advanced waste water drinking water treatment process design and operation, development of water quality requirements for various reuse opportunities, and cost-effectiveness studies are not currently supported by EPA. Eighteen major waste water reuse projects for a total investment of $5,400,000 have been supported by EPA. Among these projects are ones at Lake Tahoe, Santee, and Antelope Valley, California. Most of the EPA funded research in the fiscal year 1973 was concerned with land treatment systems for effluents and sludges. Well-known EPA financed projects in this area are groundwater recharge at Whittier Narrows, California, Pennsylvania State University's project, and the Muskegon, Michigan, spray irrigation project. (Orr-FIRL)
W76-03841

SLUDGE HANDLING AND DISPOSAL--STATE OF THE ART,
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 127-142. 1 fig, 27 ref.

Descriptors: *Waste water treatment, *Sludge treatment, *Sludge disposal, Facilities, Costs, Dewatering, Ultimate disposal, Sedimentation, Centrifugation, Flotation, Coagulation, Polyelectrolytes.
Identifiers: Filter presses, Vacuum filtration, Thickening, Conditioning, Pasteurization.

A critical analysis of the state of the art of sludge handling and disposal is presented. In addition, the attitudes towards sludge treatment and disposal that have determined the nature of present practices are discussed. Sludge treatment and disposal account for 25 to 50% of the total cost of waste management; they are the largest single factor in the total cost of operating and maintaining waste water treatment facilities. Sludge treatment and disposal systems involve thickening, conditioning, dewatering, conversion, transportation, and ultimate disposal. A significant reduction in sludge handling costs can be achieved by effective thickening. Thickening is accomplished by gravity sedimentation, by dissolved air pressure flotation, and by centrifugation. Organic chemical coagulants, such as ferric chloride and lime, are the most common chemical conditioners, but the use of synthetic organic polyelectrolytes is increasing. Dewatering sludges makes them more amenable to solids handling procedures, reduces their volume, and increases their fuel value. Vacuum filtration and filter pressing are used for dewatering. Conversion include anaerobic digestion, combustion, aerobic digestion, composting, disinfection, and

pasteurization. Current attitudes towards sludge handling and disposal do not constitute the most rational approaches. A system of regional sludge handling facilities is suggested. Sludge handling needs to be incorporated into the total waste treatment scheme, not left as an afterthought, as it is currently left in many cases. (Orr-FIRL)
W76-03842

SLUDGE RECYCLING: THE WINSTON-SALEM EXPERIENCE,
F. C. Styers.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 143-152.

Descriptors: *Sludge treatment, *Sludge disposal, *Recycling, Fertilizers, Dehydration, Industrial wastes, Sewers, Waste water treatment, Treatment facilities, Ultimate disposal.

A brief description is presented of the composition of the Winston-Salem industrial community, its sewer use ordinance, and its waste water treatment facility as background to the Winston-Salem sludge recycling project. The sludge was originally air dried and then offered free-of-charge to local farmers. When it became apparent that the amount of sludge produced was greater than could be utilized locally, a dehydration plant was constructed. This plant dehydrated the air-dried sludge and made it available to the public either in bags or bulk. The product of this plant was officially named Grogonite. There was no problem with producing a saleable product from the city's sludge. However, many legal problems hampered the marketing of the Grogonite. Winston-Salen now has a contract with Orgonics, Incorporated of Rhode Island. Orgonics will blend the sludge for formaldehyde and urea and produce a product (Organiform-SS) which contains 16% nitrogen. Orgonics will then sell this product to chemical manufacturers who will use it in blending various fertilizers. The dehydration plant facility is being modified to produce the new product. For each tone of Organiform-SS that is sold, the city will receive $5. (Orr-FIRL)
W76-03843

HAULING DIGESTED SLUDGE IN TANK CARS,
General American Transportation Corp., Chicago, Ill.
M. S. Kostolich.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 178-185, 2 fig.

Descriptors: *Sludge treatment, *Sludge disposal, *Ultimate disposal, Transportation, Railroads, Waste disposal, Costs.
Identifiers: Waste freighters.

A system for removing sludge from municipalities for disposal at a remote site is explained. The system uses railroads and specially designed cars hooked into unit trains. The system is called the Waste Freighter. The basic vehicle is a GATX 20,000 gallon tank car with special fittings. Sludge can be loaded through the top of the tank through a quick-operating manway cover, or through a loading connection at the bottom of the tank. Sludge is unloaded through a 12 inch valve at the bottom of the tank which can be equipped with a movable chute to direct the sludge beyond the rail ties. The tank car can hold about 80 tons of sludge; overloaing is prevented by a ball float device which automatically shuts off the flow at the desired level. Two loading systems have been designed (indoor and outdoor) which can adapt to any combination of sludge volume vs. desired loading times. The use of the Waste Freighter in a hypothetical city which produces a volume of sludge equivalent to about 4 million people is discussed. Using a 80 car unit train, a 200 mile trip to the application site (a strip mine to be reclaimed), and 7000 tons of wet sludge with 6% solids by weight, the cost to the city for this service would be less than two dollars per ton. The Waste Freighter eliminates capital investment in costly new sludge treatment facilities and a transportation system, conforms to present and future pollution standards, and can be easily expanded by increasing the number of tank cars. (Orr-FIRL)
W76-03844

THE EFFECT OF INCINERATION ON METALS, PESTICIDES, AND POLYCHLORINATED BIPHENYLS IN SEWAGE SLUDGE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Lab.
For primary bibliographic entry see Field 5D.
W76-03845

THE OCEANS AS ULTIMATE SINKS FOR WASTEWATERS AND WASTEWATER RESIDUALS,
Duke Univ., Beaufort, N.C. Marine Lab.
R. T. Barber, and W. Kirby-Smith.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 199-213. 3 fig, 1 tab, 23 ref.

Descriptors: *Waste water disposal, *Sludge disposal, *Oceans, *Environmental effects, Legislation, *Ultimate disposal, Waste assimilative capacity.
Identifiers: Ocean disposal, Benthic waters.

The Ocean Dumping Law, H.R. 9727, prohibits dummping of radiological, chemical, or biological warfare agents or high level radioactive wastes, and provides for the strict regulation of any material which could adversely affect human health, welfare, the marine environment, ecological systems, or economic potentialities. The ecological response to certain kinds of intentional waste dumping are discussed, and a basis is provided for the value judgements required to determine if a given ecological response is an adverse effect. The deep ocean ecosystem is a high diversity system, containing a large number of species. High diversity systems are stable under a constant environment, but are fragile when faced with environmental variations. Thus, ocean disposal would adversely affect the deep ocean systems if the ocean dumping produced changes in the environment. Research has determined that microbial turnover rates in the deep ocean are very slow. Work performed with the submersible Alvin of the Woods Oceanographic Institution on microbial degradation in deep ocean systems is described. The low turnover rates indicate that organic rich waste would accumulate on the ocean bottom if dumped beyond the continental shelf. The organic overload from a short period of dumping could last for centuries or longer. There is evidence that the relatively rapid degradation of certain wastes by deep sea metazoans is adapted only to these specific food resources; organic wastes such as sewage sludge would have to be degraded by the microbial populations rather than by the metazoans. (Orr-FIRL)
W76-03846

DETERMINING ULTIMATE CAPACITY OF THE COASTAL ZONE FOR WASTEWATER AND WASTEWATER RESIDUALS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
J. H. Carpenter.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 216-224, 8 ref.

Descriptors: *Waste water disposal, *Sludg disposal, *Oceans, Environmental effects, Was assimilative capacity, Ultimate disposal, Co tinental shelf, Coasts.
Identifiers: Ocean disposal, Coastal waters.

The following factors are important when co sidering the capacity of coastal waters for s similating waste waters: conditions leading possible transmission of bacterial, viral parasitic human diseases; contamination seafood with toxic chemical substances; a changes in the physical and chemical char teristics of the waters and sediments which cause changes in the abundance and diversity marine life. Since the different areas of the coa zone of the United States have different physi and biological systems, emission standards m be developed on a regional basis. A hypotheti situation is discussed: the disposal of a v digested, dispersible, and sterile sludge into northeast coastal zone. The effects of disposal transparency, nutrients, dissolved oxygen conc tration, and heavy metals are discussed. Alte transparency, nutrient concentrations, and solved oxygen concentrations are identified controlling factors to avoid degradation of s waters. A large dilution factor is a possible ceptable design criterion for these factors. H ever, the dilution factor is so large that to disp of the total sludge production in the year would require the total renewal of shelf water adequate dilution. Alternatives to ocean disp include thickening and then burial in subma landfills, incineration, and land disposal. Thes ternatives have their own limitations. Contin attention to limited ocean disposal will be nece ry where no practical alternate can be develo (Orr-FIRL)
W76-03847

LAND DISPOSAL: STATE OF THE ART,
Cold Regions Research and Engineering L Hanover, N.H.
S. C. Reed.
In: Ultimate Disposal of Wastewaters and Residuals, April 26-27, 1973, Raleigh, N Carolina, Research Triangle Universities, p 258. 1 tab, 42 ref, 1 append.

Descriptors: *Waste water disposal, *Irrig Waste water treatment, Sewage effluents vironmental effects, Potable water, Water qu Overland flow, Infiltration, Sprinkler irrigati
Identifiers: Spray irrigation, Rapid infiltr Land application.

A multidisciplinary comprehensive technic sessment of the effectiveness and effects o disposal of secondary treatment effluents ha performed. Spray irrigation is the con spraying of inches of liquid per week on land, with an infiltration and percolation flo within the boundaries of the site. Overland is the controlled discharge of inches of liqu week onto the land, with a down-slope shee path. Rapid infiltration is the controlled dis of feet of liquid per week onto the land; th path is high rate infiltration and percolatio quality of the product water from land d methods should be close to potable/irr water standards. Any of the application mo meet the quality standards if proper site con exist and proper operational criteria are Spray irrigation is the most reliable meth lowed by overland runoff and then rapid tion. Either primary or secondary effluents applied by spray irrigation or overland methods and still achieve sufficient produc ty. The land disposal site should be treat neglected waste sink. The pretreatment st the site must be managed as a total sy produce optimum responses. (Orr-FIRL)
W76-03849

EVALUATION OF THE ACCUMULATION, ANSLOCATION, AND DEGRADATION OF STICIDES AT LAND WASTEWATER POSAL SITES,
ifornia Univ., Berkeley. Sanitary Engineering earch Lab.
primary bibliographic entry see Field 5B.
6-03871

CYCLING ALLOWS ZERO WASTE WATER CHARGE,
ck, Crow, and Eidsness, Inc., Clearwater, Fla.
. Dove.
l Engineering, Vol 45, No 2, p 48-50, ruary 1975). 3 p, 1 fig, 4 photo, 1 tab.

criptors: *Florida, *Waste water treatment, ection wells, *Recycling, Viruses, Research development, Underground waste disposal, nicipal wastes, Environmental sanitation, Fil- on, Sewage treatment, Waste water disposal, lge, Quality control.
tifiers: *Waste water recycling, Virus inac- tion, In-plant bacteria, Land disposal.

te water recycling can provide a safe, de- lable supply of water for irrigation, power ts, industries, and other non-potable urban . Several incentives for total waste water cling are described. One of the most important ne elimination of the massive use of scarce nicals and electric power required by typical nced treatment facilities. The city of St. rsburg, Florida has committed itself to total cling of its waste water with zero discharge to urrounding bays. In-plant bacteria, and virus tivation, controlled natural utilization of ents, and 100% backup of deep well injection ey factors in the design of the city's system. er this system the digested sludge from the ment plants will be reused for controlled truck ying at selected sites and as fertilizer on a 150 city-owned sod farm and nursery. The actual ment and quality control processes of the St. rshburg system are described. The advantages ne spray irrigation method used by St. Peter- g over the overland runoff and rapid infiltra- pond methods of land disposal are also ribed. (Hoffman-Florida)
-03926

TERIA FOR THE EVALUATION OF PER- APPLICATIONS (OCEAN DUMPING).
ronmental Protection Agency, Washington,

primary bibliographic entry see Field 5G.
-03932

RGING ISSUES IN FEEDLOT WASTE AGEMENT,
s A and M Univ., College Station.
primary bibliographic entry see Field 5G.
03968

AGE MANURE FOR ITS VALUE,
onsin Univ., Madison. Coll. of Agricultural ife Sciences.
Walsh, R. F. Hensler, and E. E. Schulte.
lar A1672, Wisconsin Agricultural Extension ce, Madison, May, 1975, 6 p. 5 fig, 3 tab.

riptors: *Farm wastes, *Solid wastes, id wastes, *Crop response, Odor, Lagoons, ultural runoff, Leaching.
ifiers: *Nutrient conservation, *Land sal, Volatilization.

ugh manure is a valuable by-product of the ock industry, only a fraction of its potential producing value is realized. Some of the ns are: poor distribution when applied; ru- osses; leaching; and volatilization. The pur- of this report is to discuss the fertilizing value anure, the quantity and composition of manure produced by Wisconsin livestock, and the methods of conserving and handling manure. Manure adds nitrogen, phosphorus, organic matter, potassium and other elements such as magnesium, boron, copper, calcium, sulfur, manganese and zinc to the soil. Factors affecting manure composition are the kind and amount of litter, the kind of animal, digestibility of the feed consumed, and handling and storage procedures. The distribution of nutrients in liquid and solid manure is discussed. Of the crops which can utilize nitrogen and other nutrients from the manure, corn responds best. Several methods of conserving nutrients are: (1) reduce liquid losses, (2) consider chemical preservatives, and (3) reduce volatilization losses. Methods for solid manure handling that are discussed are: (1) daily-spread manure, (2) stacked manure, and (3) loose housing manure. Liquid systems of manure handling include: (1) aerobic lagoons, and (2) anaerobic lagoons. Chlorine and hydrated lime are important chemicals in the control of odor. (Penrod-East Central)
W76-03969

CHINO VALLEY SHAKER,
G. Ashfield.
Dairy Herd Management, Vol 11, No 4, p 22-27, April, 1974. 7 fig.

Descriptors: *Farm wastes, *Dairy industry, *California, *Fertilizers, Odor, Sprinkler irrigation, Waste disposal.
Identifiers: *Waste management, Storage ponds, *Land disposal, Chino Valley(Calif).

Manure is neither an asset nor a liability but simply one of two products of the more than 700 dairy animals housed at the C. S. Musser and Sons Inc., producer/distributor dairy operation. The waste collection and handling program is organized with all the care and planning normally reserved exclusively for the prime dairy product, milk. In full cycle, the manure is flushed, pumped, separated, and stored in both solid and liquid form prior to its use as bedding and fertilizer. An intensive 13 month study was conducted to evaluate the workings of the waste retention pond. Specific goals of the study were to determine: (1) the effect of dairy waste as a pond sealant; (2) the chemical and biological action in, around and under the pond. The waste pond became effectively sealed from excess infiltration in not more than 55 days after inflow of screened dairy sewage. Odor emissions from the pond were not severe enough to create a neighborhood nuisance and the pond did not create a fly problem. Sufficient acreage of irrigated cropland to permit effective pond management and post-pond discharge of the contents is essential to make this type of pond and the accompanying waste disposal environmentally acceptable. (Cartmell-East Central)
W76-03976

SOLID WASTE HANDLING,
Pennsylvania State Univ., University Park.
A. R. Grout.
Dairy Herd Management, Vol 11, No 4, p 12-13, 1974.

Descriptors: *Solid wastes, *Slurries, *Dairy industry, *Waste storage, *Storage tanks, Storage requirements, Waste treatment, *Farm wastes.
Identifiers: *Waste management, Land disposal, Stackers, Free stall barns, Manure ponds.

While processes such as dehydration, composting, and recycling into methane are being used on manure, the best bet for most dairymen is the use of cropland as the processing medium. This generally means that manure has to be stored until proper time for land disposal. Long elevators or mechanical throwing devices are needed for stall barn manure because it will not flow. Different methods for water removal from the manure are discussed. The manure itself is transported to a stacker enclosure which, in most cases, is built of reinforced concrete. Storage capacity is figured at 1.5 cu. ft. per 1,000 pound animal unit. Capacity of storage is usually planned for a period of six months or more. Roofs over these structures are optional but desirable. Manure storage for free stall barns is stored 'as produced' as a heavy slurry with very little added bedding material. The free stall barn can be cleaned with a tractor scraper or by the new automatic scrapers. Conveyance to the storage basin can be by gutter cleaner chain, or by pushing the manure through an underground pipe with a special ram pump. The storage enclosure for this type manure is usually built below ground level with reinforced concrete walls on three sides. One end has a sloped entrance floor up to the wall level which allows manure to be brought up the ramp with a tractor loader. The spreader can be backed into the basin as the level recedes due to manure removal. Use of manure ponds with earth walls like a farm pond is also gaining acceptance for storage of this type of manure slurry. (Merryman-East Central)
W76-03977

IMPACTS OF IMPOSING SELECTED POLLUTION CONTROLS,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-03982

STATUS OF THE ILLINOIS LIVESTOCK WASTE MANAGEMENT REGULATIONS,
Illinois State Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5G.
W76-03984

DETERMINING APPLICATION RATES OF LIVESTOCK WASTES TO THE LAND,
Illinois Univ. at Urbana-Champaign. Soil Fertility Extension.
For primary bibliographic entry see Field 5B.
W76-03985

SUMMARY OF KANSAS' EXPERIENCE WITH LIQUID WASTE SPREADING,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering; and Kansas State Univ., Manhattan. Dept. of Agronomy.
H. L. Manges, L. S. Murphy, and W. L. Powers.
Presented at Midwest Livestock Waste Management Conference, Iowa State University, Ames November 27-28, 1973, 9 p. 2 fig, 3 tab, 3 ref.

Descriptors: *Farm wastes, *Kansas, *Agricultural runoff, *Lagoons, Fertilizers, Nutrients, Crop response, Salt tolerance, Chemical properties.
Identifiers: *Land disposal.

The cattle feeders of Kansas are controlling surface water pollution by catching and storing feedlot runoff in lagoons. In Western Kansas, collected runoff is evaporated since evaporation greatly exceeds rainfall. Remaining feedlots resort to land disposal of the runoff. Since land application of runoff hasn't been practiced very much, little is known about application rates. The purpose of this report is to examine and determine the pollution potential from high application rates of feedlot wastes to land. The study showed that snowmelt runoff pollutants concentration is 2 to 2 1/2 times of rainfall. Runoff storage in lagoons results in pollutants concentration increasing with the evaporation of pure water. Recommendations for runoff analyses are given. If runoff is applied as a fertilizer it should be applied at rates necessary to supply the nutrients required by the crop grown. Fertilizer recommendation for the area could be used as one criteria. Guidelines and recommendations were given for feedlot runoff application onto land. Average annual application

rates of 5, 5 and 9 inches in 1971, 1972, and 1973, respectively resulted in top corn forage yields in Kansas. Salt buildup in the soil will eventually determine application rates. (Penrod-East Central)
W76-03988

OUTDOOR, UNPAVED FEEDLOT MANAGEMENT,
Nebraska Univ., Lincoln. Agricultural Experiment Station.
J. A. Nienaber, and G. B. Gilbertson.
Presented at Midwest Livestock Waste Management Conference, Iowa State University, Ames, November 27-28, 1973, 19 p. 2 fig, 4 tab, 16 ref.

Descriptors: *Farm wastes, *Feed lots, *Design, *Agricultural runoff, Drainage, Mud, Snowmelt, Irrigation.
Identifiers: Unpaved feedlots, *Waste management, Holding ponds, Debris basins.

This report summarizes recommended management practices for control of waste from outdoor, unpaved feedlots. Area requirements for cattle, mound construction, and drainage are discussed in terms of basic requirements for satisfactory feedlot performance. Mud problems must also be considered in the design and management of the feedlot. The three basic components of a runoff control system are: holding pond, debris basin, and disposal area. Suggestions for the design and management of the feedlot, debris basin, holding pond and disposal area are given. Facilities should be planned which provide for a reduction of cattle density to 500 ft2/head during winter operations. Mounds should be constructed parallel to the lot slope and should be connected with the feedbunk and waterer. A minimum of 1.25 ac-in/acre volume should be provided if overflow is collected by the holding pond. If the overflow cannot be collected by the holding pond, 70% of the 10 year, 24-hour storm should be provided for. An excessive snowmelt should be anticipated every 2-3 years; although reduced cattle density will relieve the resulting muddy conditions. There should be a minimum holding pond storage volume of 100% of the 10-year, 24-hour storm. An existing irrigation system should be used if possible; otherwise, the minimum area for liquid disposal is 1/2 acre of pasture per acre of feedlot. (Penrod-East Central)
W76-03989

LIVESTOCK WASTE MANAGEMENT IN A QUALITY ENVIRONMENT,
Illinois Univ. at Urbana-Champaign. Cooperative Extension Service.
For primary bibliographic entry see Field 5D.
W76-03991

STUDIES ON SUBSURFACE MOVEMENT OF EFFLUENT FROM PRIVATE SEWATE DISPOSAL SYSTEMS USING RADIOACTIVE AND DYE TRACERS, PART 2, 1973-74,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5B.
W76-04000

5F. Water Treatment and Quality Alteration

PROCESS AND INSTALLATION FOR THE TREATMENT OF WATER AND OTHER LIQUIDS,
Abwassertechnik und Kunst stoffbau GmbH, Waiblingen (East Germany). (Assignee).
For primary bibliographic entry see Field 3A.
W76-03515

SELF-CONTAINED WATER TREATMENT SYSTEM,
K. F. Elkern.
U S Patent No 3,920,552, 4 p, 5 fig, 15 ref; Official Gazette of the United States Patent Office, Vol 940, No 3, p 1371, November 18, 1975.

Descriptors: *Patents, *Water treatment, *Reclaimed water, *Water pollution control, *Aeration, *Mixing, Bodies of water, Lakes, Streams, Rivers, Rehabilitation, Chemical treatment.

Water treatment equipment is provided which can be selectively used for both aerating and chemically treating water. The system comprises a mixing tank which has means for drawing ambient water from a nearby lake, stream, or river. Air or chemicals are introduced into the water and thoroughly mixed thereby treating the water. The treated water is then returned to the ambient water where it is thoroughly mixed by means of a turbine mounted at the end of a conduit. The water treatment unit is completely self-contained and can be mounted on a truck body or trailer and then moved to whatever lake or stream that needs to be treated. (Sinha-OEIS)
W76-03519

EXPERIMENTAL RESEARCH DATA ON HYGIENIC EVALUATION OF THE METHOD OF MAGNETIC TREATMENT OF WATER, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W76-03536

RADIOCHEMICAL METHODOLOGY FOR DRINKING WATER,
Environmental Monitoring and Support Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-03635

DESIGN AND OPERATION OF HIGH-RATE FILTERS-PART 1,
Montgomery (James M.), Inc., Pasadena, Calif. Water Treatment Div.
For primary bibliographic entry see Field 5D.
W76-03665

MICROSCREENING AND DIATOMITE FILTRATION,
New York State Dept. of Health, Albany.
S. Syrotynski, and D. Stone.
American Water Works Association Journal, Vol 67, No 10, p 545-548, October, 1975. 3 fig, 7 tab, 3 ref.

Descriptors: *Diatomaceous earth, Microorganisms, Plankton, *Water treatment, *Filtration, New York, Treatment facilities, Pre-treatment(Water), Analysis, Screens.
Identifiers: *Diatomite filters, *Microscreening, Microscopic particles, Geneva(NY).

Four microscreening units have been installed in New York State since 1961 as pretreatment processes. The existing water quality information as related to the performance of these units in New York is studied and the microscopic-removal performance of a water plant using a microscreening-diatomaceous earth-water treatment process is evaluated. Previous studies on microscreens have found a 90.4% average reduction in plankton concentration; a 44.6% average reduction in the concentration of total microscopic particles; and, a microstrainer effluent with a more uniform concentration of plankton and total microscopic count than present in raw water. Tests in New York have found that microscreening is effective in removing microscopic particles and that diatomaceous earth filters are even more effective, but if there are excessive total counts of microscopic particles, the filtration times would be cut down. These two methods were tested in conjunction in the Geneva, NY, water supply system. Six filtration cycle were used in the tests. Analyses were conducte pre- and post-micro-screening and after diatomi filtration. These tests showed that the use micro-screening as a pretreatment proces lengthened the filter runs for the diatomite an slow sand filters. Diatomite filtration achieve more acceptable levels of microscopic particle than microscreening. Data are too limited to con pare the efficiency of removals by different size microscreens. (Pinto-FIRL)
W76-03671

WATER OZONATION PLANT AT WROCLA (STACJA OZONOWANIA WODE W WROCLAWIU),
B. Jasinski, A. Madrecka, A. Olech, and K. Wichlinska.
Gaz, Woda i Technika Sanitarna, Vol 49, No 6, 187-191, 1975. 11 fig, 3 ref.

Descriptors: *Water treatment, *Ozone, Tre ment facilities, Tanks, Equipment, Od Chlorination.

An ozonating station for water treatment described. Its chief components are ozone gene tors and contact tanks. Each generator consists a cylindrical stainless steel body with steel tub containing dielectric pipes. The tubing is c nected with two chambers, one of which is fed air, while the other accumulates ozonated air. ring-shaped space between the metal and dielec tubing is maintained in which air or oxygen is c verted into ozone by means of an electri discharge. Contact between ozonated air water occurs in the contact tank which is made of three parallel-arranged contact chambers. E chamber has five compartments of water con occurs between the first and the second between the fourth and the fifth compartments each chamber. Ozone is supplied to the second third compartments, where excess ozone in water is first produced and then maintained. arrangement results in a level of 2 mg/liter ozone at a daily output of 180 cu m over a pe of 21 min in the three parallel-arranged chamb Ozone utilization achieves a quality of water forming to health regulations, reduces co returns normal odors, and normalizes bacte composition in the water. Further, it elimina the need for initial chlorination and reduces doses of final chlorination to the prophyl level, thus limiting corrosive conditions due to C12 effect. The mean atmospheric ozone con tration in the ozonating station is between 0.02 0.15 mg/cu m. (Tallert-FIRL)
W76-03674

OZONE DISINFECTION PILOT PLANT S DIES AT LACONIA, NEW HAMPSHIRE,
Laconia Water Works, N. H.
R. A. Morin, J. W. Keller, T. J. Schaffernoth, D. R. Paquette.
Journal of the New England Water Works sociation, Vol 89, No 3, p 206-224, Septem 1975. 1 fig, 7 tab.

Descriptors: *Ozone, *Disinfection, *Vir *Water treatment, *Activated carbon, plants, *Treatment facilites, New Hamps Water supply, Lakes, Operating costs, C costs, Filtration, Adsorption, Chlorination.

A treatment system using activated carbon ad tion and ozone to effect virus inactivation tested for the water supply at Laconia, Hampshire. Pilot plant studies were conduct substantiate the effectiveness of ozone as icidal agent and to establish the required d and contact time. A cost analysis for a pro Ozone-Activated Carbon plant was also formed. Based on the pilot plant experimen ozone dosage of 1.0 to 1.25 ppm would pr adequate viral and bacterial disinfection relatively clean lake water. The constructio

ual operating costs of the treatment scheme, uding pretchlorination at 1.5 ppm, activated on filtration and adsorption, disinfection with to 1.50 ppm ozone and post-chlorination at 0.2 were determined. (Kramer-FIRL)
5-03688

E-SETTLERS: THEORY AND PRACTICE,
an Inst. of Tech., New Delhi. Dept. of Civil ineering.
. Singh.
an Journal Environmental Health, Vol 17, No 152-163, April, 1975. 4 fig, 2 tab, 7 ref.

criptors: *Sedimentation, *Design criteria, ters, *Water treatment, Water demand, Water urces development, Settling basins.
tifiers: Tube settlers, India.

ign criteria for sedimentation basins using -clarifiers are presented, based on work done dia. Two cases were detailed using rectangu- nd circular sedimentation tanks. The surface loading rate is the most important design rion for such tanks. The angle of inclination he tube settlers was discussed. Plastic tubes light weight and long life-spans, manufac- ed as a 'tube-module' have provided for sim- and inexpensive installation. It was found ible to increase the capacity of existing angular clarifier tanks by 100 to 200% and that ircular tanks by up to 100%. When these are in conjunction with mixed-media filters, the city of an existing waterworks can be tripled out additional facilities construction. The im- ance of design techniques for newly develop- ations was emphasized. (Kramer-FIRL)
-03689

NATION OF WATER: ROLE OF HYDROX- RADICALS AS OXIDIZING INTER- DIATES,
genoessische Anstalt fuer Wasserversorgung, asserreinigung und Gewaesserschutz, Zurich tzerland).
igne, and H. Bader.
nce, Vol 190, No 4216, p 782-784, September, 3 fig, 1 tab, 8 ref.

riptors: *Ozone, *Water treatment, *Waste r treatment, *Model studies, Kinetics, ytical techniques.
ifiers: Hydroxyl radicals, *Ozonation.

e is used as the oxidizing agent for water and e water treatment in various countries. Exten- literature on reactions involving hydroxyl als may be applied to evaluate and optimize ozonation processes. Experiments were con- d which showed that ozone reacts with sub- s in water by two different pathways and that oxyl radicals are important oxidative inter- ates formed in the decomposition of ozone. A ion scheme was tested. It was demonstrated types of oxidants involved in the reaction be identified from the relative rates at which of substrates compete with each other for the nt. Thus, the previously recorded and nt experimental data on the reactions of oxyl radicals may be used to describe oxida- following ozone decomposition. (Kramer-)
03703

DIES ON THE ADSORPTIVE EFFECT OF VATED CHARCOAL ON CHLORINATED BIPHENYLS IN WATER ON PCB NO KASEITAN KYUCHAKU RI NI KANSURU KENKYU),
ondo, T. Kishi, T. Shimamoto, T. Nishihara, . Watabe.
a Daigaku Yakugaku Kiyo, (Memoirs of the ty of Pharmaceutical Sciences), Vol 18, p 38, 1974. 7 fig, 5 ref.

Descriptors: *Water treatment, *Activated carbon, *Adsorption, *Polychlorinated biphenyls, Organic compounds, Laboratory tests, Mixing, *Waste water treatment.

The effectiveness of activated carbon adsorption of polychlorinated biphenyls (PCB) in water was investigated. PCB solution was mixed with activated carbon, and the adsorption rate of low chlorinated derivatives was found to be higher than that of high chlorinated derivatives. These results agreed with those of an activated carbon column method. Adsorption activity of the carbon was effected more by the diameter of the carbon particle than by the volume of carbon. The 70-145 mesh particles were the most effective. (Kramer-FIRL)
W76-03715

SOCIAL AND ECONOMIC DEVELOPMENT CRITERIA IN POTABLE WATER AND SEWERAGE SYSTEMS (CRITERIOS SOCIALES Y ECONOMICOS DE DESSARROLLO EN LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO),
M. B. Ahumada.
Recursos Hidraulicos, Vol 4, No 2, p 216-222, 1975. 2 tab.

Descriptors: *Potable water, *Sewage, *Water quality control, *Water quality standards, *Water rates, Community development, Costs, Rural areas, Construction, Water costs, Operating costs, Treatment facilities, *Mexico.

Rates for potable water and sewerage systems in Mexico date from about two decades ago. However, the cost of living has risen dramatically in the past few years, causing increased operating costs. Thus, the water and sewage treatment systems do not have available income to cover their service costs nor to pay amortization of and interest on invested capital. There is little financing for necessary expansion or rehabilitation. The problem of restructuring present rates is discussed. Governmental policy emphasizes educating the user regarding the benefits received from adequate potable water and sewerage service. Community participation in the construction and maintenance of new facilities is strongly urged to insure higher standards of living in this country. (Kramer-FIRL)
W76-03808

RETOOLING THE WATER WORKS INDUSTRY,
Stevens, Thompson and Runyun, Inc., Portland, Oreg.
F. C. Cooper.
Public Works, Vol 106, No 11, p 72-73, November, 1975. 2 fig.

Descriptors: *Water treatment, *Water analysis, *Laboratory tests, Ozone, Viruses, *Treatment facilities, Toxicity, Heavy metals, Iron, Turbidity, Research and Development.

The available new technology for the water treatment industry was reviewed. Much of this technology has not yet been demonstrated in large-scale water treatment plants. The most common water treatment process--alum coagulation, settling, and chlorination--is not totally effective in removing toxic materials. Organic removal requires different techniques, varying with local conditions. Activated carbon treatment and ozonation are offered as alternatives for disinfection. To destroy pathogenic bacteria and viruses, it has been found that a single disinfectant or treatment process is not always sufficient. Overly polluted river sources often require pre-ozonation or superchlorination followed by dechlorination with activated carbon or sulfur dioxide. Inorganic contaminants must also be treated by special methods. Some toxic chemicals, such as lead, mercury, arsenic, cyanide, chromium and cadmium, may be removed by chemical polymerization and precipitation, with subsequent gravity settling and filtration. Heavy metals may be removed by ion exchange or softening processes. Iron and manganese, which cause turbidity, have been oxidized successfully with ozone. While the water industry has the basic tools to develop better technology, additional research is urged. (Kramer-FIRL)
W76-03809

HYGIENIC EVALUATION OF CHLORINATING WATER BY PRODUCTS OF THE ELECTROLYSIS OF SODIUM CHLORIDE SOLUTIONS, (IN RUSSIAN),
V. A. Slipchenko, E. I. Saigak, and A. D. Kharchenko.
Gig Sanit. 11. 90-91. 1974.

Descriptors: Public health, *Electrolysis, *Chlorination, Potable water, *Water treatment, Chlorides.
Identifiers: *Eltrolytic chlorination.

Electrolytic chlorination is suitable for treating drinking water with the use of flowthrough electrolyzers having Ti-Pt electrodes at a current strength up to 4000 A/m2, solution concentration 10-50 g/l and temperature of the outgoing solution up tp 50 degrees.--Copyright 1975, Biological Abstracts, Inc.
W76-03813

THE CONSTRUCTION AND OPERATION OF GRAVEL WELL SOURCES WITH PARTICULAR REFERENCE TO THOSE OF THE NENE AND OUSE WATER BOARD,
For primary bibliographic entry see Field 3B.
W76-03817

PVC PIPE IN WATER DISTRIBUTION: RELIABILITY AND DURABILITY,
Petrochemicals Co., Inc., Fort Worth, Tex.
W. D. Nesbeitt.
American Water Works Association Journal, Vol 67, No 10, p 576-581, October, 1975. 7 fig, 1 tab, 14 ref.

Descriptors: *Pipelines, *Plastics, *Pipes, *Water distribution(Applied), Construction materials, Water treatment, Water supply, Costs, Regression analysis, Joints(Connections).
Identifiers: *Polyvinyl chloride(PVC) pipe.

The benefits and limitations of polyvinyl chloride (PVC) pipes from water utilities are outlined. The properties of PVC pipe that provide reliability and durability in water distribution systems are outlined. Costs benefits, such as flow capacity, strength-to-weight ratio, ease of handling, and joining technology are discussed. Because PVC is nonbiodegradable, it is not susceptible to the attack of bacteria or other microorganisms. However, PVC should not be exposed to heavy solvents and aromatics, and it may be affected by exposure to ultraviolet rays. PVC has the advantage of dielectric strength; it will not convey electric current and is not susceptible to electrolytic corrosion (as is metal piping). PVC pipe is flexible, giving it an advantage when it must be laid through unstable or heavy soils. PVC is a thermoplastic material, and allowances must be made in design and installation for expansion and contraction if pipeline will provide service over a wide range of temperatures. Safety factors for PVC and for traditional piping materials were compared. While plastic pipe can withstand short-term pressure surges, stresses and pressure ratings must be figured into pipeline design. Stress regression (SR) curves are presented and detailed. PVC, however, if subjected to a long-term history of cyclic pressure surges, may display failure, similar to that displayed in traditional piping materials. It was suggested that municipal water distribution systems should carefully consider the benefits as well as limitations in evaluating the use of polyvinyl chloride material for pipelines. (Kramer-FIRL)
W76-03830

ORGANICS IN DRINKING WATER, PART I-LISTING OF IDENTIFIED CHEMICALS,
Ames Lab., Iowa.
For primary bibliographic entry see Field 5A.
W76-03850

ENVIRONMENTAL LAW--1974 STYLE.
For primary bibliographic entry see Field 5G.
W76-03927

CRAWFORD V. STATE (LACK OF FLOURIDATION OF WATER NO BASIS FOR WITHHOLDING PERMIT FOR WATER WORKS INSTALLATION).
For primary bibliographic entry see Field 6E.
W76-03943

5G. Water Quality Control

ENVIRONMENTAL MANAGEMENT FOR THE METROPOLITAN AREA-WATER QUALITY, PART III.
Stevens, Thompson and Runyan, Inc., Seattle, Wash.
Prepared for Environmental Protection Agency and Municipality of Metropolitan Seattle, Washington, November, 1974. 283 p, 51 fig, 69 tab, photos. IGA-00037.

Descriptors: *Environmental control, *Water quality control, *Planning, *Water pollution control, *Water management(Applied), Water quality, *Non-structural alternatives, *Sewerage, Environmental effects, Water quality standards, Law enforcement, *Washington, Sewage treatment.
Identifiers: Environmental management, *Seattle(Wash), Cedar River(Wash), Green River(Wash), *River Basin Coordinating Committee(RIBCO).

The water quality management study, which began in 1971, defined a basin-wide water quality management program in Cedar and Green River Basins as part of a total environmental planning effort conducted by the River Basin Coordinating Committee (RIBCO). This report is intended to provide decision-makers with the basic tools and information needed to maintain and enhance water quality from both a regional and local standpoint. Existing water quality conditions of each individual water body are analyzed, factors affecting the water quality including point and non-point sources are identified, and a spectrum of water quality management alternatives are proposed. The water quality was found to be of high standard although changes can be expected from non-point wastes. A monitoring program coupled with water management studies for individual small drainages would allow corrective measures to be tailored to local conditions and needs. Other alternatives outlined include more stringent laws and guidelines, a regional sewerage plan and a dynamic management system that anticipates and identifies deficiencies in water quality and then systematically records responses of water quality to changes in land use, assesses the impacts, formulates alternatives and selects an appropriate implementation strategy. (Salzman-North Carolina)
W76-03501

SEPARATION OF EMULSIFIED LIQUIDS,
Combustion Engineering, Inc., New York. (Assignee).
I. P. Mail.
U S Patent No 3,919,081, 4 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 890, November 11, 1975.

Descriptors: *Patents, *Oil pollution, Water pollution, *Oily water, *Water pollution control, *Water quality control, *Separation techniques, Emulsions, Activated carbon.
Identifiers: Agglomeration.

The separation of insoluble liquid hydrocarbons and water which are bound together in an emulsion in which the dominant phase is the water, is described. A bed of activated carbon is installed in a tank and the activated carbon is washed with acid to remove alkaline ash. Then the bed is saturated or wetted with insoluble hydrocarbons where it clings to the media to form passages through the bed with the insoluble hydrocarbons as their walls. The emulsion is passed through the bed by gravity to agglomerate the insoluble liquid hydrocarbons in the mixture into droplets large enough to readily coalesce into a body. The water and insoluble liquid hydrocarbons are collected and discharged separately. (Sinha-OEIS)
W76-03507

TREATMENT OF FLOATING POLLUTANTS,
Loctite (Ireland) Ltd, Dublin. (Assignee).
D. J. O'Sullivan, and B. J. Bolger.
U S Patent No 3,919,083, 4 p, 9 ref; Official Gazette of the United States Patent Office, Vol 940, No 2, p 890, November 11, 1975.

Descriptors: *Patents, *Water pollution treatment, *Oil pollution, *Inorganic compounds, *Oil spills, Water pollution, Water pollution control, Water quality control, Chemical reactions, Polymers.
Identifiers: 2-cyanoacrylic acid.

Compositions and processes for the treatment of oil slick and other floating water-borne pollutants of water expanses and their margins is described. A chemical treatment of such pollutants incorporates them in a solid, semi-solid, reticulate or honeycomb-like mass or matrix, and reduces or destroys their propensity to cling to objects with which they come in contact. A composition containing at least one substance which polymerizes to a matrix with incorporation of at least a portion of the pollution is applied. The composition used in the process commonly are those containing polymerizable esters of 2-cyanoacrylic acid. These esters can comprise the total of the composition, but other ingredients may be incorporated. The most convenient method of application is by spraying, such as from a pressurized cylinder containing the composition. The composite mass which is formed may float or sink depending on its density relative to that of the fresh or salt water. If it floats, as is frequently preferred, it may be swept or raked up mechanically and disposed of. If it sinks, the preponderance of the pollution threat is also removed. In either case, the pollutant is incorporated and enclosed in a chemically and physically innocuous form. (Sinha-OEIS)
W76-03508

FLOATING ANTI-POLLUTION BARRIER,
Pneumatiques, Caoutchouc Manufacture et Plastiques Kleber-Colombes (France). (Assignee).
L. Ballu.
U S Patent No 3,919,847, 4 p, 6 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 940, No 3, p 1145, November 18, 1975.

Descriptors: *Patents, *Water pollution control, *Pollution abatement, Oil pollution, Flotsam, Jetsam, *Barriers, Floating, *Separation techniques.

A floating antipollution barrier used to catch floating articles or substances consist of one or more floating elements and a skirt made of flexible material such as a fabric impregnated with rubber or a similar material. The barriers comprise a skirt which is supported by a floating element which extends over the entire length of the skirt but which consists of a series of sealed compartments made of a flexible fabric. These compartments do not communicate with each other and are interconnected by means of strips of fabric, the width of which is between 5 and 20% of the distance separating two consecutive strips. The barries are produced by constructing entirely each of the closed sealed compartments and then by joining the strips so as to interlink the different compartments and simultaneously to ensure sealin between these different compartments. The com partments are closed containers. They may be i flated with air but this necessitates an inflatio operation per compartment and thus a fairly lon period of time to prepare the barrier. Thus, it often preferable to place inside these compar ments a substance or mechanical elements such a ring, which gives them a shap and keeps th shape so that the volume of water which they di place is sufficient to ensure adequate floatabilit (Sinha-OEIS)
W76-03513

DEALING WITH OIL SPILLAGE CONTAMIN TION,
National Water Well Association, Worthingto Ohio.
T. E. Gass.
Water Well Journal, Vol 29, No 10, p 32-3 November 1975.

Descriptors: *Oily water, *Water pollution tre ment, Soil contamination, *Oil spillage, Oil pol tion, Water wells.
Identifiers: Charcoal filtration, Imbiber bea Well water.

Numerous reports of well water contaminati due to oil contamination are recorded each ye Many of these cases are due to minor spills close proximity to the wells. A number of meth are described by which the well water or aqui can be purified. Methods include: pumping well to waste, charcoal filtration, installation Imbiber Beads, removal of contaminated soil, installation of a new well. (Gass-NWWA)
W76-03522

FEED AND FIBER FROM EFFLUENT-GRO WATER HYACINTH,
Florida Univ., Gainesville. Dept. of Agricult Engineering.
For primary bibliographic entry see Field 5D.
W76-03551

AQUACULTURE AS A MEANS TO ACHI EFFLUENT STANDARDS,
Oklahoma State Dept. of Health, Oklahoma C Water Quality Monitoring and Research Div.
For primary bibliographic entry see Field 5D.
W76-03554

SOCIAL, POLITICAL, REGULATORY MARKETING PROBLEMS OF MAR WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 6B.
W76-03563

THE MICHIGAN STATE UNIVERSITY WA QUALITY MANAGEMENT PROGRAM,
Michigan State Univ., East Lansing. Inst. of W Research.
For primary bibliographic entry see Field 5D.
W76-03565

POLYCULTURAL WASTEWATER RECLA TION AT CALIFORNIA POLYTECHNIC ST UNIVERSITY--AN ACADEMIC INST TIONAL SYSTEM,
California Polytechnic State Univ., San Obispo. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5D.
W76-03567

THE DIALECTICS OF A PROPOSAL BIOLOGICAL CONTROL OF EUTROPH TION IN SEWAGE LAGOONS,
National Taiwan Univ., Taipei.
For primary bibliographic entry see Field 5C.
W76-03570

E HARVESTING OF ALGAE AS A FOOD URCE FROM WASTEWATER USING NATU- L AND INDUCED FLOCCULATION CHNIQUES,
iisville Univ., Ky.
primary bibliographic entry see Field 5D.
6-03571

PROGRESS REPORT ON THE INTERNA- ONAL CONVENTION ON CIVIL LIABILITY R OIL POLLUTION DAMAGE AND ITS SUP- EMENTARY FUND CONVENTION,
ice of the Judge Advocate General (Navy), shington, D. C.
D. Wood.
vironmental Law Reporter, Vol 5, No 6, p 03-50107 (June 1975). 5 p, 66 ref.

criptors: *Oil spills, Ships, *International law, ited Nations, Accidents, Oil industry, Trea-, Political aspects, International waters, United es, Costs, International, Joint commission, eign countries, Cleaning, Oily water, Oil pollu-, Jurisdiction, Adoption of practices, Water ution control, Legal aspects, Environmental cts.
ntifiers: Liability Convention, Fund conven-, *Oil tankers, *Torrey Canyon disaster, ability, Intergovernmental Maritime Consulta- Organization(IMCO), Grounding, Oil cleanup, ct liability, Hazardous substances(Pollution), rnational agreements.

International Convention on Civil Liability for Pollution Damage has been ratified by the isite number of nations to activate that treaty. suggested that a supplementary agreement, Fund Convention, will be forthcoming. Both ventions arose out of United Nations concern the problems and questions raised by the Tor- Canyon disaster of 1967, where a small oil ker polluted the shores of Great Britain and nce. Massive cleanup expenses were incurred no adequate mechanism for reimbursement. Liability Convention basically provides strict lity for oil spills. Judgements rendered by the rts of one contracting nation can be enforced in other contracting nation. The Fund Conven- is designed to establish a large compensation l financed by a levy on oil imported by sea to tracting nations. Contracting nations agree to gnize the Fund as a legal entity which can sue be sued in the courts. Since the Liability and d Conventions will establish the basic interna- al law on oil pollution liability, early ratifica- by the United States is urged to promote inter- onal acceptance of the treaties. (Parrish-ida)
6-03584

E FEDERAL WATER POLLUTION CON- OL ACT AND FORESTRY,
ional Forest Products Association, Washing- D.C. Environmental Quality Dept.
. Grefrath.
nal of Forestry, Vol 72, No 12, p 757-759 cember 1974). 3 p, 10 ref.

criptors: *Water pollution control, *Federal er Pollution Control Act, *Forestry, ministrative agencies, Navigable waters, eral government, State governments, Pollu-, Forest management, Forest watersheds, Pol- n abatement, Permits, Navigation, Wildlife, mming, Fishing, Recreation, Agriculture, Ef- nts, Sediments, Adoption of practices, Ad- stration, Water quality, Industries, Watershed agement.
ntifiers: *Non-point source(Pollution), Na- al Pollutant Discharge Elimination em(NPDES), Administrative regulations.

article surveys the effects of the Federal er Pollution Control Act (FWPCA) of 1972 on stry, over the past two year period. Under the states are assigned primary responsibilities for water pollution control and enforcement, with the Environmental Protection Agency (EPA) as administering agent. Under the Act, pollution point sources such as paper mills and sawmills must comply with effluent limitations on the discharge of pollutants into waterways. Control of non-point sources falls under water quality standards that are set by the states and approved by the EPA. The goal set by Congress is that by 1983, all waters will support fishing and swimming where possible. With regard to forestry, this means the states may require forest landowners to comply by regulating forest practices either indirectly, through water control standards, and requiring owners and operators to adjust or discontinue forest practices; or directly, through established performance standards for timber harvesting, chemical application, road construction, and other field operations. Further, the forestry profession, has a responsibility in developing water pollution control programs that comply with the FWPCA. (Parrish-Florida)
W76-03586

A SUGGESTED STATE FOREST PRACTICES ACT (MECHANISM FOR IMPROVING WATER QUALITY ON FOREST LANDS),
Environmental Protection Agency, Washington, D. C.
J. L. Agee.
Journal of Forestry, Vol 73, No 1, p 40-41, (January 1975). 2 p, 2 ref.

Descriptors: *Water pollution control, *Federal Water Pollution Control Act, *Forestry, *Administrative agencies, Navigable waters, Federal government, State government, Forest management, Forests, Forest watersheds, Pollution abatement, Industries, Effluents, Adoption of practices, Water quality, Sawmills, Pollutants.
Identifiers: Suggested State Forest Practices Act, *Non-point sources(Pollution), Administrative regulations, Effluent limitations.

Under the 1972 Amendments to the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) has become increasingly involved in the area of forest management. Originally, EPA focused primarily on pollution from pulp mills and fiberboard processing plants; but recognition that non-point source pollution will emerge as the major barrier to achievement of the act's 1983 goals has led to several EPA reports on methods for evaluating non-point sources. Other EPA studies have resulted in a logging road construction manual, a manual of forest chemical use, and a harvesting manual. The initial draft of the 'Suggested State Forest Practices Act' reflects EPA's recognition that an enormous variety of conditions, including land ownership, topography, soil type and climate will affect a state's need for legislation and the form such legislation should take. The suggested act requires approval of all forest management plans and places the burden of proof on the potential polluter to show that reasonable steps are being taken to prevent pollution. (Parrish-Florida)
W76-03587

HOW NOW BROWN COW: REGULATION OF FEEDLOT POLLUTION IN WISCONSIN,
Harvard Law School, Cambridge, Mass.
C. E. Blackwell. III.
Environmental Affairs, Vol 3, No 4, p 769-792 (1974). 24 p, 4 tab, 83 ref.

Descriptors: *Feed lots, *Farm wastes, *Wisconsin, *Eutrophication, *Rainfall-runoff relationships, Sodium, Magnesium, Public health, Recreation, Phosphorus, Nitrogen, Agriculture, Farm management, Livestock, Fertilizers, Diseases, Runoff, Rainfall, Rivers, Lakes, Rivers and Harbors Act, Federal Water Pollution Control Act, Water pollution control, State governments, Federal governments.
Identifiers: *Non-point sources(Pollution), *Federal Water Pollution Control Act Amendments of 1972, Refuse Act, Point source(Pollution), Effluent limitations.

Runoff from animal feedlots is a major non-point source of pollution. While the exact meaning varies, feedlot in this article is defined as any concentrated animal feeding operations for raising and holding cattle, hogs, sheep and poultry. In time of heavy rain, the runoff from such feedlots is likely to be high in nitrogen, phosphorus, magnesium, potassium and sodium. These chemicals accelerate the eutrophication process in rivers and lakes. The problem is particularly bad in Wisconsin where a growing water recreation industry is in direct conflict with strong agricultural interests. Under the Federal Water Pollution Control Act Amendments of 1972, feedlots have been designated a point source of pollution. However, the Environmental Protection Agency (EPA), which had been granted authority to administer the 'clean up' program, has attempted to abrogate the effectiveness of the Act, reputedly because the policing of greater numbers of small feedlots would create unacceptable manpower demands on the Agency. The problem of feedlot pollution, therefore, is still largely unsolved. (Parrish-Florida)
W76-03590

UNITED STATES ENVIRONMENTAL LAWS AND EXPLORATION AND PRODUCTION OPERATIONS,
Atlantic Richfield Co., Dallas, Tex. North American Producing Div.
H. R. White.
Alberta Law Rev, Vol 13, No 1, p 1-17 (1975), 17 p, 80 ref.

Descriptors: *Oil industry, *Environmental effects, *Rivers and Harbors Act, *Water Quality Act, *Federal Water Pollution Control Act, Legal constraints, Oil pollution, Regulation, Permits, Oil wells, Federal governments, State governments, Jurisdiction, Water pollution, Oil spills, Oil fields, Regulation, Environmental control.
Identifiers: *1972 FWPCA Amendments, Licenses, National Environmental Protection Act, Oil Pollution Act, Environmental impact statements, Environmental policy.

To help assure adequate protection of the environment, numerous statutes have been enacted to provide regulation of the oil and gas industry. To provide a background for discussing modern legislation, a brief overview of the evolution of environmental legislation is presented showing that some degree of environmental control has been in existence since the early 1900's. Due to a tremendous upsurge in environmental awareness, however, the great proportion of current environmental laws and regulations have enacted in the last decade. To illustrate the degree of this regulation, the author describes the Acts and regulations which must be complied with today in order to get a permit to explore for oil or gas, Special attention is given to the provision in the National Environmental Policy Act that requires that an environmental impact statement be issued for every major federal action significantly affecting the quality of the human environment. Also emphasized is the impact that water quality legislation, such as the Federal Water Pollution Control Act and the National Pollutant Discharge Elimination System, has had on the oil and gas industry. (Hoffman-Florida)
W76-03592

A NEW APPROACH TO INTERNATIONAL ENVIRONMENTAL COOPERATION; THE NATO COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY,
Environmental Protection Agency, Washington, D. C.
R. E. Train.
Kansas Law Review, Vol 22, No 2, p 167-191 (1974). 25 p, 92 ref.

Descriptors: *Governmental interrelations, *Organizations, *Information exchange, *International commissions, *Political aspects, Legal aspects, Water, Water law, United States, Water pollution, Water pollution control, Bodies of water, Institutions, Planning, Water policy, International waters, Future planning(Projected), Environment, Technology.
Identifiers: *NATO, Committee on the Challenges of Modern Society(CCMS), International agreements, Coastal waters, Inland waters.

International cooperation in the environmental area falls into two categories: international standard setting; and exchange of technology, knowledge, and experience. The second category presents the most problems. The main shortcoming of efforts in this area has been the failure to make the information exchanged a factor in domestic policy making. International cooperation in the exchange of technology and scientific data currently takes place on global, regional, and bilateral levels. However, many of these efforts have accomplished little beyond providing for exchange of information. In 1969, the need for a new, more flexible and action-oriented approach to multinational environmental cooperation resulted in the creation of the North Atlantic Treaty Organization Committee on the Challenges of Modern Society (CCMS). CCMS has undertaken pilot studies in sveral areas. The final report on a study of inland water pollution is currently in the drafting stage, while a study of coastal water pollution has resulted in various NATO resolutions. (Schilling-Florida)
W76-03594

TECHNOLOGY FOR MANAGING SPILLS ON LAND AND WATER,
Calspan Corp., Buffalo, N. Y.
D. B. Dahm, and R. J. Pilie.
Environment Science and Technology, Vol 8, No 13, p 1076-1079, (December 1974). 4 p, 3 photo, 5 tab, 5 ref.

Descriptors: *Phenols, *Control, *Seepage control, *Research and development, *Chemicals, Water quality control, Water pollution control, Multiple-purpose projects, Projects, Technology, Water pollution sources.
Identifiers: Hazardous materials, Spill technology, Sulfuric acid.

The U. S. Environmental Protection Agency (EPA), Office of Research and Monitoring, has initiated intensive research and development programs in hazardous material spill control technology. Some of the hazardous materials involved include sulfuric acid, phenol, and acrylonitrile. Until recently the attitude toward these spills has been that little can be done except to evacuate the area. The EPA's research program, however, has discovered several promising control methods such as: foam-in-place plugs to stop the flow from leakage containers, foam-in-place dams to prevent the flow of a spilled material from reaching a watercourse, a physical-chemical treatment unit to treat hazardous material spills confined in a watercourse, and floatable, activated carbon or ion-exchange resins to treat spill in a flowing stream. Statistics and detailed information on these control methods are given. Tables are set forth which rank hazardous compounds by annual production quantity, ranking soluble hazardous substances by production and toxicity, and reporting typical hazardous spills in 1973. There is also a discussion of the problems involved in the protection of personnel dealing with these hazardous materials. (Hoffman-Florida)
W76-03595

WPCF LOOKS AT WATER CLEANUP PROBLEMS AND PROSPECTS.
Environmental Science and Technology, Vol 8, No 13, p 1073 (December 1974). 1 p, 2 photo.

Descriptors: *Federal Water Pollution Control Act, *Management, *Economic efficiency, *Financing, Economics, Water pollution control, Environmental effects, Planning, Administration, Project post-evaluation, Water policy, Federal government, Decision making, Standards, Water pollution, Government finance, Sludge, Carbon.
Identifiers: Monitoring systems.

John Parkhurst, president of the Water Pollution Control Federation, told the WPCF's annual conference that the Federal Water Pollution Control Act Amendments of 1972 are not suitable for implementation. Parkhurst argued that the uniform national standards required by the amendments defeat the purpose of attaining cost effective water pollution control. He expressed doubt that even the Federal Government could finance systems necessary to comply fully with the Act. Another complaint was that all major aspects of water pollution control must be directed at the federal level, and that the law is so explicit that it leaves little room for administrative judgement. In addition to Parkhurst's speech, there were several company press conferences at the WPCF convention. Air Products and Chemicals, Inc., discussed the increasing use of its oxygen activated sludge environmental systems. Envirotech Corp. announced its new DC-60 total organic carbon monitor while Philips Electronic Instruments, Inc., described its new line of automatic water monitoring stations that measure numerous parameters. (Hoffman-Florida)
W76-03596

NEW CLASSIFICATIONS ADOPTED AND ASSIGNED TO CERTAIN WATERS IN THE YADKIN RIVER BASIN.
North Carolina Environmental Management Commission, Raleigh.

Descriptors: *Classification, *Water zoning, *Water allocation(Policy), *Water supply development, *Municipal water, *North Carolina, State governments, Conservation, Streams, Water treatment, Water conservation, Water distribution(Applied), Water demand, Dams, Water quality, Boating, Diversion dams, Diversion, Protection.
Identifiers: Public hearings, Creeks, *Yaakin River basin(NC).

This report contains the proceedings of a public hearing held by the Water and Air Quality Control Committee of the Environmental Management Commission relative to an application filed by the town of Yadkinville, North Carolina. The application requested the reclassification of South Deep Creek and its tributaries from that of use for fishing and boating (Class 'C') to that of use as a public water supply (Class 'A-11'). Testimony given by various local water authorities indicated that Yadkinville needs a high quantity, high quality source of water, and that the waters of South Deep Creek would fill that need. Reclassification of the Creek would allow Yadkinville to proceed with its plan to construct a diversion dam to withdraw water for treatment at a plant near the dam site with a capacity of 1.83 million gallons per day. Since there was no opposition to upgrading the classification, the Committee recommended its approval. (Parrish-Florida)
W76-03598

STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY--PROPOSED EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 43, Part III, p 8294-8307, March 4, 1974. 14 p.

Descriptors: *Water quality standards, *Administrative agencies, *Regulation, *Effluents, *Steam, *Thermal pollution, Thermal power, Thermal powerplants, Standards, Wate pollution, Treatment, Water treatment, Wast treatment, Federal Government, Wastes, Wate pollution sources, Electric power, Heated wate Water cooling, Sewage effluents Discharge(Water), Industrial wastes, Wast water(Pollution), Waste water disposal.
Identifiers: Administrative regulations, Effluer limitations, Pretreatment standards(Effluent Federal Water Pollution Control Act(FWPCA Amendments of 1972, Hazardous sul stances(Pollution).

Notice is hereby given of proposed effluent limit tions guidelines for existing sources and standar of performance and pretreatment standards f new sources in the steam electric power generati category, pursuant to the Federal Water Polluti Control Act (FWPCA), as amended. Therm (waste heat) control and treatment technologi are of two general types; those which are design to reduce the quantities of waste heat reject from the process in relation to the quantities electrical energy generated and those which a designed to eliminate to some degree the relian upon a navigable water body as a step toward ul mate transfer of the rejected heat to and beyo the atmosphere. Effluent limitations correspon ing to the best practicable control technology c rently available are no discharge of heat except cold-side blowdown for all large base-load uni Mechanical draft evaporatine cooling towers p vide the basis for evaluation of costs, efflu reduction benefits, and other factors. Limitatio attainable under the best available technolo economically achievable requires cold-side blo down and closed-cycle evaporatine cool systems. (Fernandez-Florida)
W76-03601

MEAT PRODUCTS POINT SOURCE CATEG RY--SMALL PROCESSOR SUBCATEGORY; FLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washingt D..
Federal Register, Vol 39, No 168, p 31485-31 August 28, 1974. 13 p.

Descriptors: *Water quality standa *Environmental effects, *Administrative ag cies, *Water pollution, *Food processing indus Industries, Legal aspects, Water law, Regulat Federal government, Technology, Economic pact, Water pollution control, Water pollu treatment, Water quality control, Pollutants, fluents, Water pollution sources, Nitrites, Wat Identifiers: *Federal Water Pollution Control Amendments of 1972, Administrative regulati Effluent limitations.

The Environmental Protection Agency he proposes effluent limitations and guidelines fo isting sources and standards of performance pretreatment standards for new sources for meat products point source category. proposed regulation will amend present re tions by adding a small processor subcateg meat cutter category, sausage and luncheon processor subcategory, ham processor subca ry, canned meat processor subcategory and renderer subcategory. The regulation requires existing point sources achieve effluent limita which represent the best practible co technology currently available by July 1, 19 also requires the achievement, by not later July 1, 1983, of effluent limitations which in the best available, economically achiev technology which will result in reaso progress toward the national goal of elimi the discharge of all pollutants. New point so must achieve a Federal standard of perfor which reflects the greatest degree of ef reduction achievable through the best ava control technology, including a standard mitting no discharge of pollutants, when pra ble. (Nursery-Florida)
W76-03602

AT PRODUCTS AND RENDERING
OCESSING POINT SOURCE CATEGORY--
LUENT GUIDELINES AND STANDARDS.
ironmental Protection Agency, Washington,

eral Register, Vol 40, No 2, Part II, p 901-914,
ary 3, 1975, 14p.

criptors: *Industraial wastes, Effluents,
ter pollution control, Discharge(Water),
ge effluents, Liquid wastes, Waste water
sal, Standards, *Water quality standards,
lation, Penalties(Legal), Technology,
nomic impact, Economic justification, Water,
r law, Legal aspects, Environmental effects.
ifiers: *Meat processing plants, *Effluent
lines, Effluent limitations, Hazardous sub-
es(Pollution).

e regulation establish final effluent limitations
lines for existing sources and standards of
rmance and pretreatment standards for new
es in the meat product and rendering
ssing category of point sources. The regula-
concern six new subcategories which in-
: small processor; meat cutter; sausage and
eon meat processor; ham processor; canned
processor; and renderer. No adverse
omic impact is foreseen as a result of these
requirements. Implementation of these ef-
t limitations guidelines should substantially
e the environmental harm which would
wise be attributable to the continued
arge of polluted waste waters from existing
ewly constructed plants. Preceding the regu-
s is a summary of the significant comments
ved by the Environmental Protection Agency
rming the initial proposed regulations and the
cy's response to them. The new subcatego-
re delineated in terms of applicability and
iption of the subcategory; effluent limitations
lines representing the degree of effluent
tion attainable by the application of the best
cable control technology currently available;
nt limitations guidelines representing the
e of effluent reduction attainable by the ap-
ion of the best available technology economi-
achievable; standards of performance for
ources; and pretreatment standards for new
es. (Hoffman-Florida)
03603

N MILLS MANUFACTURING POINT
CE CATEGORY--EFFLUENT LIMITA-
S AND GUIDELINES.
onmental Protection Agency, Washington,

al Register, Vol 40, No 2, Part III, p 915-922,
ry 3, 1975. 8 p.

iptors: *Industrial wastes, *Water quality
rds, *Sewage disposal, *Waste water
al, Regulation, Technology, Economic im-
Effluents, Water quality control, Sewage ef-
s, Discharge(Water), Liquid wastes, Federal
ction, Water pollution treatment, Water pu-
ion, Water, Water law, Legal aspects, En-
nental effects.
fiers: *Grain mills, Effluent guidelines,
ent limitations.

regulations establish final effluent limita-
nd guidelines for existing sources and stan-
of performance and pretreatment standards
w sources in the grain mills manufacturing
ry of point sources. The regulations concern
ew subcategories: animal feed, hot cereal;
to-eat cereal; and wheat starch and gluten.
is indicates that the economic impact of the
nes is minimal. No plant closures are an-
ed if current practices are continued. The
nentation of the guidelines should substan-
educe the environmental harm which would
ise be attributable to the continued
rge of polluted waste waters from existing
ewly constructed plants in the grain mills
acturing industry. Various sections under the four subcategories include: description and applicability of the subcategory; specialized definition; effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practical control technology currently available; effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable; standards of performance for new sources; and pretreatment standards for new sources. (Hoffman-Florida)
W76-03604

INTERVENTION ON THE HIGH SEAS ACT.
For primary bibliographic entry see Field 6E.
W76-03606

UNITED STATES V. SMITH (DREDGING AND FILLING MARSHLAND WITHOUT CORPS OF ENGINEERS PERMIT).
For primary bibliographic entry see Field 6E.
W76-03607

PEOPLE OF CALIFORNIA EX REL. STATE WATER RESOURCES CONTROL BOARD V. ENVIRONMENTAL PROTECTION AGENCY (ACTION TO REQUIRE EPA TO NOT EXEMPT FEDERAL AGENCIES FROM PERMIT PROGRAMS).
For primary bibliographic entry see Field 6E.
W76-03610

SPRINGER V. JOSEPH SCHLITZ BREWING COMPANY (DIVERSITY ACTION BY OWNERS OF DOWNSTREAM FARM ALLEGING DISCHARGE INTO MUNICIPAL TREATMENT FACILITY WHICH CAUSED OVERLOAD AND POLLUTION).
For primary bibliographic entry see Field 6E.
W76-03611

NATURAL RESOURCES DEFENSE COUNCIL, INC. V. TRAIN (ACTION BY ENVIRONMENTAL GROUP TO COMPEL PUBLICATION OF EFFLUENT GUIDELINES BY THE ENVIRONMENTAL PROTECTION AGENCY).
For primary bibliographic entry see Field 6E.
W76-03612

DEPARTMENT OF NATURAL RESOURCES V. LINCHESTER SAND AND GRAVEL CORP (APPEAL BY LANDOWNER FROM DENIAL OF PERMIT TO DREDGE AND FILL PRIVATE WETLANDS).
For primary bibliographic entry see Field 6E.
W76-03617

HOLIDAY INNS, INC. V. POLLUTION CONTROL BOARD (PETITION FOR REVIEW OF ORDER DENYING VARIANCE FROM WATER POLLUTION RELATIONS REGARDING EFFLUENT).
For primary bibliographic entry see Field 6E.
W76-03618

REPORT ON WASTEWATER SERVICE CHARGES, METROPOLITAN SEWERAGE DISTRICT, BUNCOMBE COUNTY, NORTH CAROLINA.
Greeley and Hansen, Chicago, Ill.
Prepared for Metropolitan Sewerage District, Buncombe County, N.C., February, 1975 (Rev.). 46 p, 2 fig, 13 tab, 2 append.

Descriptors: *Pollution charges(Taxes), *Pricing, *Cost analysis, *Adjusted prices, Grants, Waste water, Wastes, Suspended solids, Biochemical oxygen demand, Waste water treatment, *North Carolina.
Identifiers: Buncombe County(NC), Asheville(NC), French Broad River(NC), Swannanoa River(NC), Weaverville(NC), Reems Creek(NC), Cane Creek(NC), Wastewater volumes, Wastewater strength.

There are 21 major industrial contributors and 25,760 domestic customers (residential users, all commercial and institutional users with small volume discharges and no significant strength characteristics) to the wastewater disposal system in the Asheville Metropolitan Area. Adjustments to service charges are now required due to the need for continuous chlorination of the effluent, the increased cost of power, and inflation. The objective of this study is the development of a schedule of charges resulting in industry assuming its reasonable share of the total annual costs. Specifically, the new formula for determining user charge is based on: (1) unit costs related to quantity, to biochemical oxygen demand, and to suspended solids and (2) the users' actual contributions to the wastewater volume and these waste strength parameters. Design of the total system assumes an approximate annual average flow of 25.5 mgd, 38,850 pounds per day BOD, and 48,350 lbs/day suspended solids. Proposed unit charges for domestic users based on costs during fiscal year 1975-1976 are $.32 per 100 cubic feet of wastewater. Proposed industry charges are $.097 per 100 cf of wastewater, $.051 per lb of BOD, and $.025 per lb of SS by 1977-78. Federal guidelines provide for the recovery of that portion of the Federal grant allocated to the conveyance and treatment of the wastes from each industrial user. Grant recovery is to be based on allocation of the grant to functions and the annual discharge of waste volume and lbs of BOD and SS. These recovery charges are to be billed to the appropriate industries at the end of each year. (Henley-North Carolina)
W76-03628

HANLON CREEK ECOLOGICAL STUDY, PHASE A.
Guelph Univ. (Ontario). Centre for Resources Development.
Prepared for Hanlon Expressway Technical Advisory Committee, Guelph, Ontario. Publication No 50, September, 1971. 66 p, 12 fig, 9 tab, append.

Descriptors: *Cover crops, *Water pollution control, *Erosion control, *Road banks, *Environmental effects, *Highway effects, *Water quality control, Planning, Land use, Nonstructural alternatives, Sediment control, Water management(Applied), *Canada.
Identifiers: Hanlon Creek(Ontario Canada).

The existing micro-drainage system, including the biological and physical characteristics, of the Hanlon Expressway Corridor in the vicinity of Hanlon Creek is inventoried and analyzed in relationship to the effect of proposed expressway works. Detailed plans for the Expressway are examined to identify aspects of the project which result in adverse modification to existing natural life systems. This report attempts to identify techniques for the management of Hanlon Creek and vicinity which will allow the continuation of an environment capable of supporting at least the existing levels of aquatic and terrestrial life. Assuming that good planning attempts to allow a broad spectrum of alternatives, recommendations include both construction and post-construction phases: erosion control, installation of sediment ponds, minimization of destruction of existing vegetation, protection of exposed soil surfaces with cover plants, replanting program using more salt-tolerant plants to withstand salt deicing programs, frequent inspection and repair of drainage works. An environmental monitoring system should be established within the watershed to obtain data needed for establishment of design criteria. To develop an effective environmental management program, research into alternative

techniques, e.g. erosion control measures, pollutant sensitivity monitors and design standards, should be intensified. (Salzman-North Carolina)
W76-03629

OKANAGAN WATER DECISIONS,
Simon Fraser Univ. Burnaby (British Columbia). Dept. of Geography.
T. O'Riordan, and J. O'Riordan.
Western Geographical Series, Vol 4, H. D. Foster, ed. University of Victoria, 1972. 158 p, 9 fig, 11 plates, 21 tab, 213 ref.

Descriptors: *Water management(Applied), *Decision making, *Multiple-purpose projects, *Political constraints, *Political aspects, Project planning, Local problems, Cost-benefit analysis, *Canada, Nutrients, Limnology, Pollution, Eutrophication.
Identifiers: *Okanagan-Shuswap water basin(B C), Nutrient loading, Penticton(B C), Salmon Arm(B C), Public participation, Pollution Control Act(Canada).

Okanagan-Shuswap water basin provides a recreational and scenic environment deteriorating in quality. Water quality management, planning and decision-making processes in 2 small villages that are dependent upon the quality of water for their economic viability are discussed. Each case history examines the political mechanisms available, public attitudes toward water quality and citizen participation in the policy and decision-making process of water management. The municipal governments of Penticton, Salmon Arm Village and Salmon Arm District proposed various plans and techniques to effectuate their determined water policies to meet their unique problems, both political and environmental. These case studies show that decisions are constrained by uncertainty of environmental side effects and lack of ecological data, by financial limitations, by inadequate communication between the public and decision-makers, and weak senior government guidelines to insure regional cooperation. The latter section of this report explores the implications of Canada's new river basin planning strategy on the evaluation process and describes an evaluation matrix to compare alternative plans. The evaluation matrix involves 3 steps: impact analyses, comparison with zero alternative and weighting schemes. By adding social and environmental impacts to benefit-cost analysis, the evaluation matrix enables more comprehensive and relevant resource management decisions to be made as well as allow multiple-objective planning to be used. (Salzman-North Carolina)
W76-03630

EXPERIENCE IN THE SANITARY PROTECTION OF WATER BODIES IN A RAION OF MOSCOW, (IN RUSSIAN),
Sanitary Epidemiology Station, Konakovo (USSR).
For primary bibliographic entry see Field 5D.
W76-03637

IRON BACTERIA AND RED WATER,
Dearborn Chemical Div., Mich.
For primary bibliographic entry see Field 5B.
W76-03640

APPARATUS FOR THE SEPARATION OF DIFFICULTLY MISCIBLE OR NON-MISCIBLE LIQUIDS,
O. Kunz, R. Hartmann, and N. Sinnersdorf.
United States Patent 3,914,175, Issued October 21, 1975. Official Gazette of the United States Patent Office, Vol 939, No 3, p 1461-1462, October, 1975, 1 fig.

Descriptors: *Patents, *Separation techniques, *Liquids, Equipment, Tanks, Pollutation abatement, Water pollution control.

A patent has been issued for a separation device for liquid dispersions of two or more mutually insoluble or partially soluble liquids. These are separated into individual liquid phases in a separating tank which has side walls and an inlet for the liquid mixture, and zig-zag shaped plate-like fittings arranged in layers one over the the other in the tank. These fittings extend across the tank from side wall to side wall, horizontally in the direction of the liquid throughput. Outlets are located in the peaks and valleys of the overlapping fittings for separating the phases. A diffusion device operates in the form of a fiber or ribbon adjacent to the inlet for the uniform distribution of the liquids as they are separated. A perforated plate extends across a cross-section of the tank, following the diffusing means and immediately preceding the plate-like fittings. (Kramer-FIRL)
W76-03660

QUALITY CONTROL STARTS AT THE PIPE,
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 5A.
W76-03694

DEVELOPMENT OF IRON AND MANGANESE BACTERIA IN RANNEY WELLS,
For primary bibliographic entry see Field 5B.
W76-03761

TOTAL POPULATION DENSITY OF CRUSTACEA AND AQUATIC INSECTA AS AN INDICATOR OF FENTHION POPULATION OF RIVER WATER,
Plant Protection Research Inst., Pretoria (South Africa).
L. P. van Dyk, C. G. Greeff, and J. J. Brink.
Bulletin of Environmental Contamination and Toxicoloty, Vol 14, No 4, p 426-431, 1975. 1 fig, 1 tab, 3 ref.

Descriptors: *Pest control, *Bioindicators, *Pesticide residues, Density, *Crustaceans, *Analytical techniques, Water quality control, Pesticides, *Avicides, Birds, Water pollution sources, Water pollution effects, Aquatic populations, Environmental effects, Sampling, Pollutant identification.
Identifiers: *Red-billed quelea, *Fenthion.

The use of fenthion in the pest control of red-billed quelea involves riverside spraying where the birds roost at night. A monitor program involving both the population density of aquatic Insecta and Crustacea, and the analysis of fenthion residue in water samples was tested experimentally. Total population density proved to be a sensitive indicator of fenthion pollution and can be used when no analytical facilities are available. This is an inexpensive method compared to the use of sophisticated collection samplers or resins. The only prerequisite is that the total population density before pollution must be known. (Katz)
W76-03779

PROCESS CONTROL AS AN AID TO POLLUTION CONTROL,
W. Steven.
Water Pollution Control, Vol 74, No 5, p 516-523, 1975, 2 app.

Descriptors: *Pollution abatement, *Water pollution control, *Data collections, *Control systems, Telemetry, Treatment facilities, Computer programs, Computers, Automatic control, Water works, Equipment, Instrumentation, Waste water treatment, Water treatment.
Identifiers: *Process control, Analytical recorders.

Process control as an aid to pollution control as applied to the Carbarns works in the Burgh of Motherwell and Winshaw, England, is discussed. The design philosophy of an automatic cont system must include two elements: accumulati of information must be such that fluctuations the system must be recorded in considerable de and number, enabling accurate conclusions plant performace; and this information must programmed into the system to automatica allow for such fluctuations. Three types of inf mation required are physical factors, chemical biological factors, and early warning factors. system described is hooked up by telemetry to other distant treatment facilities. The system c sists of a four section control console, logic recorder cabinets, three typewriters, an analyt 12-point recorder, a tape punch, a computer auto-dialing equipment. Operating procedures outlined. It was found, after three months operation of this system, that designs can alw be improved. Plant selection requires car selection in choosing such a sophisticated syst A detailed description of the physical outline mechanical details of the plant is required for software designers. In addition, it is necessary the methods of operation of the plant should carefully outlined at the programming st (Pinto-FIRL)
W76-03795

FEDERAL ENVIRONMENTAL LAWS REGULATIONS,
Fluor Engineers and Constructors, Inc., Anah Calif.
E. D. Zarytkiewicz.
In: Chemical Engineering, Deskbook Issue, 11, 13, 15, 17, October 6, 1975. 5 tab.

Descriptors: *Waste water treatment, *W quality control, *Water treatment, *Legisla *Environmental effects, *Federal jurisdic Land use, Potable water, Chemical industry spills, Federal Water Pollution Control Act.
Identifiers: Safe Drinking Water Act, Env mental Impact Statements(EIS).

A summary is presented of previous majo vironmental requirements, recently enacted lations, and future legislation and their pot impacts. Since the National Environmental Act (NEPA) of 1969 was passed, any federal cy must prepare an Environmental Impact ment(EIS) prior to taking any action that a the environment. Delays in construction due time and money required to draft an EIS caused excessive costs, which the federal go ment has now acknowledged. The 1970 Cle Act has set up maximum ambient concentr for CO, NO2, SO2, non-methane hydroca and particulate matter. The Federal Water tion Control Act of 1972 has probably ha greatest impact on all industries, particular of chemical processing, than any other en mental law. Regulations of import are: th tional Pollutant Discharge Elimination S (NPDES); Effluent Guidelines and Stan Pretreatment Standards; Oil and Hazardou stances Rules; Ocean Dumping Rules; and Pollutant Standards. Other legislation has re that facilities engaging in production, con tion, or distribution of oil prepare Spill Prev Control, and Countermeasure Plan. New la apply to the control of noise, solid waste pesticides in the environment. Recent and legislation includes the Safe Drinking Wa and new rulings to be initiated on land use (Kramer-FIRL)
W76-03806

SOCIAL AND ECONOMIC DEVELOP CRITERIA IN POTABLE WATER SEWERAGE SYSTEMS (CRITERIOS SOC Y ECONOMICOS DE DESSARROLLO E SISTEMAS DE AGUA POTABLE Y A TARILLADO),
For primary bibliographic entry see Field 5
W76-03808

ESSEX: EVOLVING WITH ITS DIVISIONS,
r primary bibliographic entry see Field 6E.
76-03811

E CONTROL OF POLLUTION OF GROUND-
ATER,
de River Purification Board, Glasgow
otland).
P. Henton.
luent and Water Treatment Journal, Vol 15, No
464-467, 473, September, 1975. 1 tab, 21 ref.

scriptors: *Waste water disposal, roundwater, Underground waste disposal, ater pollution, Legislation, Water pollution rces, Groundwater resources, Waste disposal ls, Waste water(Pollution).

undwater pollution should be prevented for eral reasons including: it is an increasingly uable source of water; it is an integral part of hydrosphere; it can reappear at the surface in course of time; and, moving wastes from the face to below ground is only storage and not a n of disposal or treatment. Contamination of undwater from surface practices includes osal of effluent to underground strata, hate from refuse tips, agricultural practices, age of oil, chemicals, and road salt, sewage or strial settling basins, individual sewage osal systems, and aquifer discharge. Aquifer rpumping and acid mine drainage are two exles of contamination resulting from the use of undwater and rock. Contamination can be on a l or regional scale; each can be just as destruc- and long-lasting as the other. The origin and re of the rock, the structural geology, nature ny faults present, direction of movement of groundwater, level and fluctuations of the r table, proximity of old mine workings, abction bore-holes or disposal points, and type quantity of waste to be disposed of are all fac- which must be considered in a situation coning groundwater pollution. A hydrogeological rt should be prepared with recommendations the suitability of any site for the particular ose in mind. Legislative controls in England roundwater pollution are discussed. The Con- of Pollution Act, 1974, tries to include all s of pollution and uses a new approach in coning underground wastes. (Orr-FIRL)
-03815

CHEMICAL FACTORS AFFECTING ARCIAL GROUNDWATER RECHARGE IN UNSATURATED ZONE,
ogical Survey, Lubbock, Tex.
V. Wood, and D. C. Signor.
sactions of the ASAE, Vol 18, No 4, p 677-
July/August, 1975. 11 fig, 1 tab, 14 ref.

riptors: *Geochemistry, *Artificial recharge, undwater, *Chemcontrol, Chemical analysis, arge, Texas, New Mexico, Ion exchange, n exchange, Cation exchange, Hydrogen ion entration, Adsorption, Hydrology.
ifiers: *Unsaturated zone, Recharge facility, ock(Tx), Mineral solution, Desorption, te reduction, Lake Meredith(Tx).

nt research on artificial groundwater recharge ocused on spatial-temporal aspects. The type magnitude of chemical controls at a site are ed. Chemical considerations are placed into ategories: the change in geometry of the intial pore space and the prediction of the quali- the water with time. The observations ssed fall into the second category. The rge facility used, a 0.4-ha basin near Lub-, Texas, is typical of the Southern High Plains xas and New Mexico, and the water was imd from Lake Meredith, near Amarillo. Porous ic cups were used to collect water samples at s of 0.6, 2, 8, 16, 23, and 33 meters, first daily hen weekly. Chemical analyses were per-ed for pH, bicarbonate and specific conductance. Chloride concentration increased with depth. Ion exchange was one of the most important chemical processes observed in the system. Cation and anion exchange took place, but cation exchange dominated. This could be an important consideration in a predictive model, depending on whether or not the water is intended for human consumption. Some sulfate adsorption takes place and the effects are still being studied. Desorption of silica was the other major mechanism that affected the water quality. Sulfate reduction signaled a hydrologic change but the effect was small because of the rapid loss of hydraulic conductivity. Some mineral solution occurred but also had a very small effect. Studies should be conducted at other sites on the Southern High Plains of Texas and New Mexico, including more detailed analyses. With enough pertinent data incorporated into a model, accurate predictions can be made on water quality changes. (Pinto-FIRL)
W76-03818

RESEARCH NEEDS RELEVANT TO ENVIRONMENTAL DATA, (PAPER OF THE TECHNICAL COUNCIL ON WATER RESOURCES PLANNING AND MANAGEMENT),
Environmental Research and Technology, Inc., Concord, Mass. Environmental Studies Div.
For primary bibliographic entry see Field 6G.
W76-03823

RESEARCH NEEDS IN THE CONTEXT OF OUR GOAL TO RESTORE AND MAINTAIN THE CHEMICAL, PHYSICAL, AND BIOLOGICAL INTEGRITY OF THE NATION'S WATERS,
National Science Foundation, Washington, D.C. Div. of Advanced Environmental Research and Technology.
E. H. Bryan.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 4-12, 6 ref.

Descriptors: *Water pollution control, *Research and development, *Research priorities, Pollution abatement, Waste water treatment, Water pollution, Technology, Research facilities, Research equipment.

The need for various kinds of research to solve water pollution problems is discussed. Both basic and applied research are relatively long-term projects that can be considered investments for the future. It is also important to invest in personnel training and research capability that will be available for implementation of needed additional research, design, construction, operation and maintenance of water pollution control facilities. However, in addition to basic and applied research, a type of research effort that is highly focussed on selected problems with the objective of solving these problems is needed. Problem-focussed research should be in reasonable balance with the more traditional types of basic and applied research. Problem identification, reasearchability and plans for the utilization of results are key factors in the selection of projects that are responsive to problem-focussed research. Since many of our water pollution problems, such as overflows of raw sewage from combined sewers and overloaded sanitary sewers, are big and expensive, the solutions must be highly cost-effective. There is also the problem of non-point source pollution, such as drainage from urban and agricultural areas. The use of current technologists to deal with current problems should cause powerful economic incentives for further research. (Orr-FIRL)
W76-03832

ZERO DISCHARGE OF INDUSTRIAL WASTEWATERS,
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
G. Rey, P. DesRosiers, and W. J. Lacy.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 22-41. 3 fig, 4 tab, 26 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Water reuse, Recycling, Research and development, Federal Water Pollution Control Act.
Identifiers: *Zero discharge, Environmental Protection Agency.

The 1972 Federal Water Pollution Control Act, PL 92-500, states that the discharge of pollutants into navigable waters must be eliminated by 1985. The major goals of the Environmental Protection Agency's industrial research and development program include research into water reuse and product or by-product recovery methods. Because industrial water quality requirements for reuse are less stringent than for municipal supplies, direct industrial water reuse (closed-cycle systems) should be technically feasible and economically achievable earlier than comparable muncipal water reuse systems. Waste water reuse is a resource conservation measure and a method of pollution abatement. By-product recovery and utilization techniques can reduce the net cost of waste water treatment and hopefully will become less expensive than disposal. Recycled water is valuable because of intake water supply shortages, increasing water supply and water treatment costs, and rising municipal sewerage charges. The recovery of usable water and thermal energy are the main techniques of reducing overall waste treatment costs. To implement water recycling at an industrial plant it is necessary to determine major water use requirements and to establish water quality requirements. A general planning guide for an industrial reuse research and development program is presented. (Orr-FIRL)
W76-03834

PUBLIC PARTICIPATION IN WATER POLLUTION CONTROL,
Environmental Protection Agency, Atlanta, Ga. Region IV.
F. E. Ravan.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 42-48.

Descriptors: *Water pollution control, *Pollution abatement, *Legislation, Federal Water Pollution Control Act, Local governments, Public rights, Environmental control, Standards.
Identifiers: Public participation.

A general discussion of the public's role in water pollution control is presented. Under the 1972 Federal Water Pollution Control Act, there must be citizen participation in hearings before the establishment of effluent limitaions for industrial or municipal facilities. In addition, the EPA administrator, in cooperation with the States, is required to provide for public participation in the development, revision, and enforcement of any regulation, standards, effluent limitation, plan, or program developed by the Administrator or any State under the Act. Minimum guidelines are set for the participation. In a very few years State regulation of construction on flood plains, or unstable hillsides, in swamps, in wetlands, or in good cropland will probably be routine all over the country. Examples of the advances that citizen groups have made in cleaning up bodies of water, as well as examples of EPA sponsored pollution concern groups are discussed. It is expected that as the population becomes aware of the benefits of pollution control and abatement, strong remedial action will be supported. (Orr-FIRL)
W76-03835

POLLUTION CONTROL OPTIONS OTHER THAN TREATMENT,
Dow Chemical Co., Midland, Mich. Environmental Control Systems.

C. L. Sercu.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 64-81. 15 fig.

Descriptors: Waste water treatment, *Industrial wastes, *Planning, Environmental control, *Pollution abatement, Cost-benefit analysis, *Water pollution control.

The necessary planning that must be performed to ensure the best solution to a waste treatment problem is chosen is discussed. Treatment of industrial wastes is not always the best way to solve the problem. Recovery, reuse, and reduction are alternatives to treatment. These three alternatives can be accomplished by such changes as process modifications, new processes, better housekeeping, and waste segregation. Cost/benefit analyses must be performed to help decide between terminal treatment and alternatives. The key to a successful program is to get commitment for pollution control from the top management. Top management must formulate the policy, goals, and assign the responsibility. Making environmental control a factor in the determination of raises and promotions will apply meaningful pressure on all personnel involved. (Orr-FIRL)
W76-03837

ULTIMATE DISPOSAL BY MEANS OF DEEP WELL INJECTION: A LEGAL VIEW,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5E.
W76-03839

HOW TO COMMUNICATE COMPLEX ISSUES TO THE PUBLIC,
Environment Reporter, Washington, D.C.
K. D. Gill.
In: Ultimate Disposal of Wastewaters and Their Residuals, April 26-27, 1973, Raleigh, North Carolina, Research Triangle Universities, p 226-228.

Descriptors: *Communication, *Technical writing, Terminology, Technology, Social aspects, Management, Publications, Environmental engineering, Psychological aspects.
Identifiers: Technical language, Technical presentations.

Lawyers, engineers, scientists, and government officials are among those professionals who have developed specialized languages of their own. Although most of the terms used within a discipline have specific meanings and convey a precise thought or concept to people within that discipline, these terms are often meaningless to others. Several practical suggestions are offered for communicating technical specialized thoughts to the public. The first point is to be aware that highly complex technical terms are being used when one discusses his specialty. The clearer the presentation, the better the chance of being understood. The second point is to make use of the press, whether reporters or public relations agencies. The ideal situation is to make available to the reporter a copy of the presentation. (Orr-FIRL)
W76-03848

THE PORTS AND WATERWAYS SAFETY ACT OF 1972: AN EXPANSION OF THE FEDERAL APPROACH TO OIL POLLUTION,
Kelso, Spencer, Synder and Stirling, Honolulu, Hawaii.
M. S. Davis.
Journal of Maritime Law and Commerce, Vol 6, No 2, p 249-257 (1975). 9 p, 60 ref.

Descriptors: *Legislation, *Oil spills, *Oil pollution, *Regulation, *Control, Harbors, Navigable waters, Standards, Design standards, Legal aspects, Coast Guard regulations, Law enforcement, Negligence, Penalties(Legal), Water law, Oil, Water Quality Act, Administration, Water pollution sources, Disaster, Oil wastes, Water pollution, Water pollution control.
Identifiers: *Environmental policy, *Hazardous substances(Pollution), *Liability(Legal aspects), *Oil Pollution Act, Absolute liability, Administrative regulations, Intentional torts, Non-point sources(Pollution), Nuisance(Legal aspects), Territorial waters.

This article discusses the provisions and ramifications of the Ports and Waterways Safety Act of 1972, which was enacted to combat the problem of oil spills in areas around ports, waterfronts, and the navigable waters of the United States. Comparing similar legislation which preceded the Act, the article states that prior to the Ports and Waterways Safety Act, the object of oil pollution legislation was to deter intentional discharges of oil through sufficiently severe penalties. Accidental rather than intentional oil spills were at the crux of the oil pollution problem. In response, the 1972 Act exemplifies legislation designed to prevent both intentional and accidental oil spills. The Act is an attempt to prevent accidental oil spills through the implementation of a system of vessel traffic control, and the imposition of construction safety standards. While acknowledging the concern of some skeptics with regard to the effectiveness of the Act, the author concludes that the real significance of the Port and Waterways Safety Act is its demonstration that Congress has shifted its concern to the more crucial problem of prevention of accidental oil pollution. (Fernandez-Florida)
W76-03917

WATER POLLUTION,
Stanford Environmental Law Society, Calif.
R. W. Harris, W. Jeffery, and B. W. Steward, Jr.
In: Interstate Environmental Problems, p 57-84, Standord Law School, Stanford, California, 1974. 28 p, 124 ref.

Descriptors: *Federal Water Pollution Control Act, *California, *Surface waters, *Water pollution sources, *Pollution abatement, Biochemical oxygen demand, Rivers, Dissolved oxygen, Coliforms, Trout, Minnows, Groundwater, Agriculture, Pesticides, Bacteria, Detergents, Standards, Acid mine water, Urbanization, Water quality, Lakes, Permits, Sewage treatment, Organic wastes, Pollutant identification.
Identifiers: Truckee River, Federal Water Pollution Control Act Amendments of 1972, Lake Tahoe, Trout standard, Golden Shiner Minnow, Non-point sources(Pollution), Effluent limitations, Feedlots, Environmental Protection Agency, Fishkills, Administrative regulations.

The types and mechanisms of water pollution, the various legal means of protecting water quality, and the application of those means in the Lake Tahoe-Truckee River area in California are surveyed in this article. Types of pollutants include: organic wastes, infectious agents, plant nutrients, synthetic organic chemicals, inorganic chemicals, sediments, radioactive wastes, and thermal pollution. A particularly destructive type of pollution is created by the meat packing industry by penning animals in feedlots. Various chemical techniques are available for detecting pollutants, as well as natural techniques such as the trout standard. Once a pollution problem is detected, water quality control authorities may compel abatement under the 1972 Amendments to the Federal Water Pollution Control Act (FWPCA), which places limitations on the discharges of effluents into navigable waters. In California, there are nine separate Regional Water Quality Control Boards in charge of enforcing FWPCA requirements. An examination of the Tahoe-Truckee system, however, reveals that federal requirements often conflict with state needs, and that solution to one part of the water quality problem--sewage treatment--can have adverse consequences in other areas of the environment. (Parrish-Florida)
W76-03921

NAVAL SUBMARINE BASE, NEW LONDO GROTON, CONNECTICUT DREDGE RIV CHANNEL, VOLUME 1, (ENVIRONMENT IMPACT STATEMENT).
Department of the Navy, Washington, D.C.
For primary bibliographic entry see Field 8A.
W76-03924

ENVIRONMENTAL LAW--1974 STYLE.
Environmental Science and Technology, Vol No 3, p 194-195 (March 1975). 2 p, 1 tab, 1 chart

Descriptors: *Water quality control, *Pot water, *Public health, *Water purification, W supply, Water law, Water management(Appli Legislation, Penalties(Legal), Domestic wa Standards, Pollutants, Wastes, Charts, Gov mental interrelations.
Identifiers: Safe Drinking Water Act.

The Safe Drinking Water Act requires the vironmental Protection Agency (EPA) to estab national primary drinking water regulations tective of public health, and national secon drinking water standards protective of public fare. States are given the primary responsib for enforcement of these standards if the elect; if not, the EPA has the responsibility. penalties are provided for violations. The Act calls for studies by the National Academ Sciences (NAS) to comment on the availabili drinking water, to report to Congress on the a bility of such standards, and to determine imum contaminant levels protective of p health. After the NAS study to determine the imum contaminant levels, revision of nationa mary drinking water regulations will occur every three years. A chart is provided at the e the article which provides effective dates for ous provisions and regulations. (Hoffman-Flo
W76-03927

NAVIGABLE WATERS OF THE COMM WEALTH OF KENTUCKY (PROPO WATER QUALITY STANDARDS).
Environmental Protection Agency, Washin D.C.
Federal Register, Vol 39, No 188, p 34574-3 Sept 26, 1974, 2 p.

Descriptors: Federal government, *Federal Pollution Control Act, *Kentucky, *Water q standards, *Administrative decisions, Navi waters, Regulation, Administration, De making, Water policy, Water law, Water q control, State governments, Governmental relations, Classification, Adoption of practic
Identifiers: *Interstate waters, *Intrastate w

These proposed regulations set forth standa water quality to be applicable to the Co wealth of Kentucky pursuant to 303(c)(4)(B) of the Federal Water Pollution trol Act (FWPCA). Under that section FWPCA, the Administrator of the Environ Protection Agency (EPA) is required to water quality standards for waters of the States which have been adopted and submi the States and approved by the EPA. W determines that changes in such standar necessary to meet the requirements of the Administrator must prepare and publish pr revised water quality standards. After the ment of the 1972 Amendments to the FWP EPA reviewed Kentucky's water quality st for both interstate and intrastate water found that changes were needed. As a resul decision Kentucky submitted new standard EPA which were approved in 1974. Furthe by the Administrator, however, showed all navigable waters in Kentucky were c by water quality standards as required FWPCA. These proposed regulations

dards for those waters found not to be covered
he Kentucky water quality standards sub-
ed to the EPA in 1974. (Hoffman-Florida)
-03930

IGABLE WATERS OF STATE OF
ZONA.
ronmental Protection Agency, Washington,

ral Register, Vol 39, No 200, p 36866-36867,
ber 15, 1974, 2 p.

riptors: *Arizona, *Water quality standards,
rients, *Federal Water Pollution Control Act,
igable waters, Regulation, Nutrient require-
s, Governmental interrelations, Law enforce-
, Administrative decisions, Administrative
ies, Water quality control, Interstate rivers,
lards, State government.
ifiers: *Intrastate waters FWPCA Amend-
s of 1972.

Federal Water Pollution Control Act
CA) requires that state water quality stan-
for navigable waters be reviewed by the Ad-
trator of the Environmental Protection Agen-
PA). A review conducted after the passage of
972 amendments to the FWPCA found that
ons were needed in Arizona's water quality
ards for interstate and intrastate waters. Sub-
ntly, Arizona adopted revised water quality
ards. These new standards, however, did not
meet the requirements of the FWPCA since
stablished no quantitative nutrient criteria.
fore, under the authority of the FWPCA, the
s proposing regulations which set forth stan-
necessary for Arizona to comply with the
Those regulations are set forth in this notice
will become effective immediately upon
ication. (Hoffman-Florida)
3931

ERIA FOR THE EVALUATION OF PER-
PPLICATIONS (OCEAN DUMPING).
nmental Protection Agency, Washington,

l Register Vol 39, No 202, p 37057-37058,
er 17, 1974, 2 p.

ptors: *Sites, *Waste dumps, *Gulf of Mex-
Organic wastes, *Incineration, Chlorides,
s, Regulation, Ultimate disposal, Ships, In-
l wastes, Water pollution sources, Chemi-
stes, Solid wastes, Organic matter, Waste
al, Waste storage, Oceans.
iers: *Ocean dumping.

thority to designate ocean dumping sites
sted in the Administrator of the Environ-
Protection Agency by the Marine Protec-
esearch, and Sanctuaries Act of 1972. Pur-
to that authority, the Administrator has
ted a new site in the Gulf of Mexico to be
r high temperature incineration of organic
e wastes. The new site is necessary because
li Chemical Company's permit to dispose
rganic chloride wastes has expired, result-
Shell's accumulation of more than 19,000
waste. To dispose of this accumulation,
ntracted for the use of a motor vessel for
ncineration of the wastes. Before the vessle
arry out the incineration, however, it had to
with all pertinent governmental regula-
hus, an application for the designation of a
mping site was submitted and approved by
A. Because the location of the site had been
sly considered at a public meeting, and
the motor vessel would be available for
imited time, the designation of the new site
effect immediately. (Hoffman-Florida)
932

COUNTY IRRIGATION AND WATER
RCES ASS'N V DUNNETT (SALT
INJECTIONS INTO GLORIETTA

SAND FORMATION NOT POLLUTANT OF FRESH WATER AQUIFIER).
For primary bibliographic entry see Field 6E.
W76-03950

COMMUNITY COLLEGE V. FOX (CLEAN STREAMS LAW OR SEWAGE FACILITIES ACT).
For primary bibliographic entry see Field 6E.
W76-03951

CITY OF BRUCE V. EDWARDS (ACTION TO RECOVER DAMAGES FOR LAND FLOODED BY CONSTRUCTION OF SEWER LAGOON BY CITY).
For primary bibliographic entry see Field 6E.
W76-03953

UNITED STATES V. DIAMOND (ACTION TO ENJOIN IN CERTAIN SALT WATER TIDAL MARSHLANDS).
For primary bibliographic entry see Field 6E.
W76-03955

UNITED STATES V. DETREX CHEMICAL INDUSTRIES, INC. (VIOLATION OF POLLUTION DISCHARGE PERMIT).
For primary bibliographic entry see Field 6E.
W76-03958

EMERGING ISSUES IN FEEDLOT WASTE MANAGEMENT,
Texas A and M Univ., College Station.
J. M. Sweeten.
Feedlot Management, Vol 17, No 5, p 16, 18, 23, 26, May, 1975.

Descriptors: *Farm wastes, *Feed lots, *Agricultural runoff, *Odor, Recycling.
Identifiers: *Waste management, Application rates, Refeeding, Sediment management.

This report discusses areas of needed improvement that are emerging in feedlot waste management. Since many feedlots have invested from $.50 to $7.00 per head of capacity for runoff control systems, care needs to be taken to protect these investments. One common problem is failure to dewater the retention structures within a prescribed time period following a major storm. Another problem is the proper determination of the right runoff application rates on crop or pasture land. Sediment management in retention ponds must also be dealt with. Possible solutions for these problems are projected. The quality of manure used in crop disposal has recently become a pressing issue. Attempts are being made to improve manure quality through better handling techniques. Animal wastes have been found to have value when recycled as gas or as feeds, but there are still problems to be worked out. Although all of the above are important aspects of feedlot management, the area with the greatest need of research is odor control. Because of the legal aspects of the odor problem, there is a great need for more research on odor measurement, odor control techniques, and prediction of odor transport phenomena. (Penrod-East Central)
W76-03968

MANAGE MANURE FOR ITS VALUE,
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
For primary bibliographic entry see Field 5E.
W76-03969

MODEL TO PREDICT THE PERFORMANCE OF FEEDLOT CONTROL FACILITIES AT SPECIFIC OREGON LOCATIONS,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-03971

LEGAL ASPECTS OF WASTE POLLUTION LAWS,
Kansas Livestock Association, Topeka.
V. Huseman.
Beef in Confinement Workshop, National Feed Ingredients Association, Des Moines, Iowa, April 4, 1974, p 27-29. 1 fig.

Descriptors: *Farm wastes, *Legal aspects, *Feed lots, *Water pollution.
Identifiers: *Water Pollution Control Act Amendments of 1972, Zero discharge.

The 92nd Congress has passed a Public Law 92-500, better known as the Water Pollution Control Act Amendments of 1972. This represented the first time that the Federal Government got into the business of regulating feedlots as they relate to the environment. Feedlots are specifically defined in the act as a 'point sources' of water pollution. The Federal Water Pollution Control Act Amendments made some unprecedented demands on the livestock industry. It states '...it is the national goal that the discharge of pollutants into navigable water be eliminated by 1985'. That section seems to imply zero discharge. It is impossible to guarantee zero discharge. The Environmental Protection Agency has not developed a set of rules or guidelines for the disposal of wastes, except to recognize that application on agricultural land appears to be the most practical method. The Environmental Protection Agency recommends that operators fill out a Short Form B so that they will be on record with them. (Cartmell-East Central)
W76-03975

RACEWAYS: EXOTIC SPECIES MOST AFFECTED BY PROPOSED E.P.A. DISCHARGE PERMITS,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
D. D. Culley, Jr.
The American Fish Farmer, Vol 4, No 8, p 9-12, July 1973.

Descriptors: *Regulation, *Permits, *Water pollution, Fish farming, Lagoons, Filtration, Recirculated water, *Waste treatment, *Farm wastes.
Identifiers: Non-native fish.

The proposed amendment of Part 125, Title 40 of the Code of Federal Regulations will affect the licensing control of pond and raceway aquaculture facilities discharging wastes more than 30 days yearly and of non-native aquatic animal productions. Raceway facilities having continuous discharge would require licensing or converting to recirculating filtration or lagoon holding systems. A permit system should serve as an incentive for aquaculturists to become more efficient in their operations. There is reason to believe that through increased efficiency of reclaiming wastes or recirculating his water, the culturist can increase profits. (Hargrove-East Central)
W76-03980

IMPACTS OF IMPOSING SELECTED POLLUTION CONTROLS,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
D. Good, L. J. Connor, J. B. Johnson, and C. R. Hoglund.
Michigan Farm Economics Report No. 360, Cooperative Extension Service, Michigan State University, East Lansing, January, 1973, 4 p, 2 tab.

Descriptors: *Farm wastes, *Michigan, *Dairy industry, *Legal aspects, *Costs, *Agricultural runoff, Odor, Waste storage.
Identifiers: Pollution control, Land disposal, Subsurface disposal.

Three selected pollution control measures are analyzed which might conceivably be applied to Michigan dairy farms. The measures are based on recent actions taken by the Michigan Water Resources Commission and Air Pollution Control Division and on statutes relative to dairy waste management that have been enacted or proposed in adjoining states. The first control measure requires control of surface water runoff at the production site. The second measure, designed to control runoff from fields to which wastes are applied, prohibits winter spreading of dairy wastes. The last measure, designed to reduce odors and field runoff associated with land application of dairy wastes, requires immediate plow-down of solid dairy wastes and/or soil injection of liquid dairy wastes. Twelve 'representative' farms were chosen for the study. Adjustments necessary to comply with the control measures were identified. These control measures will cause increased cost of operation which will inevitably be passed on to the consumer. Projections of increased costs are given. (Penrod-East Central)
W76-03982

KEEPING THE FEEDER IN BUSINESS,
Soil Conservation Service, Lincoln, Nebr.
L. G. Jackson.
Soil Conservation, Vol 39, No 2, p 10-11, September, 1973, 3 fig.

Descriptors: *Farm wastes, *Nebraska, *Feed lots, *Regulation, Water pollution, Design, Waste treatment.

The 17,000 feedlots in Nebraska cause a great many waste management problems. The Soil Conservation Service engineered a system to prevent runoff at the request of a 1000-head Adams County feedlot. A bypass system was devised that involved keeping a farm pond from discharging into the feedlot. A debris basin and holding pond were then designed that would control a 10-year, 24 hour storm that could cause runoff from the lot. The lot was sold before the system was implemented, and the new owners doubled the feedlot capacity, making it necessary for a new debris basin to be installed. The farm pond was changed to a tailwater recovery pit to which all liquid waste was carried. A pipeline was installed to carry liquid waste to the high point in the disposal area for distribution to the croplands by irrigation. Costs of the system were $3700. At the time of this publication, about 650 waste control systems had been installed on Nebraska feedlots, and more were in the design stage. All these feedlots are carefully inspected by the Department of Environmental Control in order to assure that owners do not violate water quality standards. (Sanders-East Central)
W76-03983

STATUS OF THE ILLINOIS LIVESTOCK WASTE MANAGEMENT REGULATIONS,
Illinois State Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
J. F. Frank.
Presented at Proceedings of 1973 Livestock Waste Management Conference, Champaign, Illinois, March 7-8, 1973, p A1-A5.

Descriptors: *Farm wastes, *Illinois, *Legal aspects, *Feed lots, Permits, Design, *Regulation.
Identifiers: *Waste management.

In its later years of existence, the Illinois Sanitary Water Board (SWB) conceived the need for a set of livestock waste management regulations. On July 1, 1970, the SWB's activities were taken over by the Illinois Environmental Protection Agency (EPA). This agency continued the formulation of the livestock waste management regulations. The hearing process and the Illinois EPA's role and position are discussed. Federal regulations are then examined. The U.S. EPA published on December 5, 1972, a proposed set of regulations which covered some agricultural operations. Agricultural interests gave extensive response and a task force was set up to evaluate the responses, and, if necessary, redraft and clarify the proposal. A new proposal was drafted during a two-day meeting of this task force which was held on January 29, 1973. After several public meetings with environmental groups, the proposed regulations were published in the Federal Register and a 30-day comment period was set. The operators of various classes and sizes of feedlots or livestock shelters (as listed in a table) must apply for permits, although they do not necessarily need them. Future plans of the Illinois EPA are discussed. (Penrod-East Central)
W76-03984

MY WASTE-HANDLING SYSTEM FOR BEEF,
K. H. Bartels.
Presented at Proceedings of 1973 Livestock Waste Management Conference, Champaign, Illinois, March 7-8, 1973, p L1.

Descriptors: *Farm wastes, *Agricultural runoff, *Water pollution, *Feed lots, *Costs, *Cost sharing.
Identifiers: Holding ponds.

The report discussed the correction of a feedlot wastes runoff problem. Runoff was going directly into a drainage ditch approximately 100 feet from the feedlot. With the aid of the Soil Conservation Service a waste control plan was devised. The only equipment changed for the waste handling procedure was a pump and irrigation equipment for dispensing water from the holding pond. The approximate completion cost of the project will be about $3,200 (excluding pump and equipment), but cost-sharing was utilized. The runoff now no longer pollutes the creek and the area below the feedlot is much cleaner. (Penrod-East Central)
W76-03986

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

MODERNIZING STATE WATER RIGHTS LAWS: SOME SUGGESTIONS FOR NEW DIRECTIONS,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 6E.
W76-03593

REGIONAL SKEW IN SEARCH OF A PARENT,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-03899

6B. Evaluation Process

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
J. E. Huguenin, and J. T. Kildow.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 344-356. 23 ref, 3 tab.

Descriptors: *Aquiculture, *Sewage lagoons, *Marine animals, Marketing, Political aspects, Regulation, Social aspects, Sewage effluents, Public health, Pollutants, Food chains, Water pollution control, Water pollution treatment, Social adjustment, Recycling.

There are several prerequisites before social acceptance of the use of sewage ponds to grow aquatic food animals is a realistic possibility. legitimate public health concerns must adequately assessed and resolved. There are unknowns involving the transmittal and concen tion of various pollutants through complex chains which include man, and the long term fects of these processes. Systems must developed to reduce or circumvent the high areas, and adequate public health safeguards be provided. Definite markets must either exi be created for even low-risk waste-food syst to receive social and regulatory acceptance. respect to 'safe' levels of contaminants in foo is suggested that waste-grown seafood be, respects, as good as or better than the products found on the market from na sources. The most critical factor affecting the sumer acceptance of waste-grown sea food i degree and circumstances surrounding its ferentiation from the other sources of the products, as may be required by regulatory cies. (See also W76-03541) (Witt-IPC)
W76-03563

RECYCLING FOR A PURPOSE -- BUT WHAT PURPOSE. A SOCIOLOGIST'S VIEW
Central State Univ., Edmond, Okla. Dep Sociology.
L. H. Irving.
In: Wastewater Use in the Production of Foo Fiber -- Proceedings, March 5-7, 1974, Okla City, Oklahoma, p 357-361. 8 ref.

Descriptors: *Wastes, *Recycling, change, Attitudes, Decision making, Motiv Social aspects, Psychological aspects, Wate lution control, Water pollution sources.

In order to achieve a social change of a toward a new philosophy of life (e.g., recycl wastes) the social scientist will have to be f with the current thinking and trends developed in the physical scientific comm He will have to evaluate the current level of ing of the community and design a program stitute social change and implement these c in order to bring the social acceptability community in line with the degree of technical know-how. (See also W76-03541) IPC)
W76-03564

INDIANA DUNES NATIONAL LAKESHO 820).
For primary bibliographic entry see Field 6E
W76-03600

PLANNING ASSISTANCE TO STATES (I IN PREPARATION OF COMPREHE PLANS FOR WATER AND RE RESOURCES).
Corps of Engineers, Washington, D.C.
Federal Register, Vol 40, No 25, p 5484-54 5, 1975, 9 p.

Descriptors: *Water resources develo *Comprehensive planning, *Government relations, *Coordination, *Optimum devel plans, Management, Water conservation basin development, Government finance, tion, Water policy, Alternate planning, risdiction, Natural resources, Planning, M pose projects regional development, State ments, Federal government.
Identifiers: *Water Resources Developm Water resources planning programs.

This proposed regulation provides basic and general guidelines for Corps of Engin ticipation in the state assistance authorized by section 22 of the Water R Development Act of 1974. Before the C aid a state, the state must have a planning for the development, utilization or conser water and water resources underway o

sufficient detail so that the relationship of the
's request for Corps input to some particular
ct of the program may be appraised. Any
t from the Corps will be on effort or service
ing basis rather than in the form of an outright
t. Normally the effort will be in an area of
s expertise, such as comprehensive basin
ning. in which the Corps has legislative
ority. Some of the general guidelines concern-
he assistance provide the mutually understood
s will be agreed upon with the state before the
s enters into a cooperative planning effort,
that duplication of effort and interagency
ites must be avoided. Also included in the
lation are sections concerning program
agement and funding. (Hoffman-Florida)
-03605

NAGAN WATER DECISIONS,
n Fraser Univ. Burnaby (British Columbia).
. of Geography.
rimary bibliographic entry see Field 5G.
-03630

NCE VS. MYSTICISM,
Gass.
r Well Journal, Vol 29, No 12, p 26-27,
mber, 1975.

riptors: Locating, Drilling, Exploration,
r wells, Technology, Water sources.
ifiers: Water witching, Dowsing.

iller is far better off using science and
ology in choosing a location for a well than a
er. There are two reasons for this: (1) he is
more likely to find water, (2) as a result of
ided educational programs, customers expect
equire more sophisticated services and an ex-
tion of the services they are to receive. A
er of federal, state, and local agencies will
de the well driller with the basic data for the
n which he is working. The nearest office of
nited States Geological Survey also will pro-
nformation. Another alternative would be to
ct local colleges with geology and hydrology
tments who may have completed studies in
ea in question. (Fuller-NWWA)
)3762

TO COMMUNICATE COMPLEX ISSUES
HE PUBLIC,
onment Reporter, Washington, D.C.
imary bibliographic entry see Field 5G.
)3848

ER ALLOCATION,
ord Environmental Law Society, Calif.
imary bibliographic entry see Field 4A.
)3920

ECONOMICS OF GEOTHERMAL
URCES IN THE IMPERIAL VALLEY: A
IMINARY ANALYSIS,
rnia Univ., Riverside. Graduate School of
istration.
imary bibliographic entry see Field 3E.
3959

Cost Allocation, Cost Sharing, icing/Repayment

SHARING FOR RECREATION: EFFI-
CY AND EQUITY': COMMENT,
al Bureau of Standards, Washington, D.C.
g Economics Section.
Marshall.
Economics, Vol 51, No 3, p 300-303, 1975. 1
ef.

Descriptors: *Distribution, *Economic efficiency, *Cost sharing, Equity, Recreation, Cost-benefit analysis, Water resources development, Local governments.

The conclusions reached by Miller and Scherr in 'Cost Sharing for Recreation: Efficiency and Equity', (1974) based on the methodology developed by Marshall (1970) are questioned. (See W74-07307 and W71-00755). It is claimed that Miller and Scherr have misapplied the analysis in the original Marshall Paper in the following ways: (1) They do not really show efficiency impacts of different cost-sharing rules; (2) they accept Marshall's Association Rule, but fail to explain allocation of total costs for the multiple-purpose project necessary to arrive at recreation costs; (3) they do not actually treat cost-sharing rules as such; they conclude that changing cost-sharing rules are a weak method of redistributing cost by income class; and (4) they maintain that local benefits diminish. As a result of this misapplication their conclusions regarding scale, distributions, and facility mix for recreation cost sharing are not convincing. (Carpenter-Wisconsin)
W76-03535

REPORT ON WASTEWATER SERVICE CHARGES, METROPOLITAN SEWERAGE DISTRICT, BUNCOMBE COUNTY, NORTH CAROLINA.
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-03628

THE ECONOMICS OF GEOTHERMAL RESOURCES IN THE IMPERIAL VALLEY: A PRELIMINARY ANALYSIS,
California Univ., Riverside. Graduate School of Administration.
For primary bibliographic entry see Field 3E.
W76-03959

6D. Water Demand

MEASURING OUR WATER SUPPLY,
J. Humphreys.
In: Our Natural Resources: The Choices Ahead, U.S. Department of Interior, Conservation Yearbook, Series No 10, p 29, 1974. 1 p, 1 illus.

Descriptors: *Flood data, *Flood plain zoning, *Flood profiles, *Geologic mapping, Water supply, Development, Water resources development, Water levels, Comprehensive planning, Mapping, Water utilization, Warning systems, Flood control, Flood forecasting.
Identifiers: Upstream drainage.

Statistics are given concerning the amount of water used in this country. Despite an increasing demand, the overall water supply is more than adequate to meet foreseeable needs, providing we bear the cost of keeping it clean, storing and transporting it and increasingly recycling it. To help communities meet future demands, the Geological Survey is conducting a flood-prone-area mapping program to delineate the approximate flood boundaries of streams across the nation. The information on flood-prone areas is presented on quadrangle maps which then serve as valuable guides for public agencies and private citizens concerned with land development. Flood areas have been identified for: (1) urban areas where the upstream drainage basin exceeds 25 square miles, (2) rural areas in humid regions where the upstream drainage exceeds 100 square miles, (3) rural areas in semiarid regions where the upstream drainage basin exceeds 250 square miles. (Hoffman-Florida)
W76-03597

FLOOD HAZARD PATTERNS OF URBAN DEVELOPMENT IN THE UPPER MIDWEST,
Western Illinois Univ., Macomb. Public Policy Research Inst.
For primary bibliographic entry see Field 4A.
W76-03627

REPORT ON WATER FOR ENERGY IN THE UPPER COLORADO RIVER BASIN.
Bureau of Reclamation, Denver, Colo. Water for Energy Management Team.
July 1974. 71 p, 8 fig, 17 tab.

Descriptors: *Water resources, *Energy, *Colorado River Basin, *Oil shales, Fuels, Electric power, Electric powerplants, Cooling water, Colorado River compact, Consumptive use, Reservoirs, Surface waters, Water storage, Water requirements, Water supply, Agriculture, Groundwater, Legal aspects, Water law, Weather modification, Water management(Applied).

The water resources and water needs for energy in the Upper Colorado Basin were reviewed. It was concluded that sufficient water in the Upper Basin to meet energy developments and other anticipated needs to the year 2000 will not be available unless certain state and federal actions are taken soon. These actions include strong state leadership in the resolution of water rights and water allocation actions and the attainment of efficiency in water use. Additional storage facilities will be required and augmentation of the supply will be needed through weather modification. Groundwater can be utilized as an interim supply prior to development of surface storage and subsequently as a conjunctive supply. The adoption of air cooling for thermal powerplants and the shift of water use from agriculture to industry will also be necessary to some extent. It should be noted that this picture is the situation as it is seen today; only the prototype oil shale program has been evaluated, and the rapidly changing energy situation can produce a much different picture in a short time. (Sims-ISWS)
W76-03727

THE FUTURE OF WATER RESOURCES IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
W. C. Ackermann.
Journal of the American Water Works Association, Vol 67, No 12, p 691-693, December 1975. 1 fig.

Descriptors: *Water resources, *Systems analysis, *Lake Michigan, *Illinois, Water supply, Water transfer, Water values, Water requirements, Water demand, Groundwater, Surface waters, Population, Withdrawal, Mining, Recharge, Planning, Artificial recharge, Costs, Flow augmentation, Groundwater resources.
Identifiers: *Northeastern Illinois, *Lake Michigan water, Water deficits, Groundwater deficiencies, Mining aquifers, Raw water, Future demands, Least-cost study, Digital simulation model.

Several possibilities were investigated for increasing water supplied before the year 2020 for six northeastern Illinois counties. A United States Supreme Court decree of 1966 limited Illinois to 3200 cubic feet per second of Lake Michigan water. Many towns in the area were expecting water deficits by the year 1990 unless additional water could be secured from Lake Michigan or developed from new or, at that time, unusable sources. The Illinois State Water Survey undertook a complete systems analysis of water resources and future water demands in northeastern Illinois. A second detailed analysis considered economic aspects of groundwater development in the area. The cost of raw and treated groundwater produced in quantities sufficient, in most cases, to meet projected demand to 2020 was estimated for 104 area townships. Water from shallow sand aqui-

fies, shallow dolomite aquifers, and deep sandstone aquifers was considered. Unit cost of treated water varied from 22-53 cents per 1000 gallons. It was concluded that additional water could come from the Kankakee River, groundwater recharge, reuse, and possibly from treated brackish water from deep aquifers. Eventually, it was concluded that a substantial quantity of Lake Michigan water will be needed, particularly in areas peripheral to those now using Lake Michigan water. (Roberts-ISWS)
W76-03755

BULL RUN SAFE YIELD STUDY,
For primary bibliographic entry see Field 4A.
W76-03792

WATER RESOURCES IN NORTHUMBRIA WITH PARTICULAR REFERENCE TO THE KIEDLER WATER SCHEME,
Northumbrian Water Authority (England). Northumberland and Tyne Div.
For primary bibliographic entry see Field 6E.
W76-03824

APPENDIX 15, IRRIGATION, GREAT LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Arbor, Michigan, Public Information Office.
For primary bibliographic entry see Field 3F.
W76-03868

EVALUATION AND PROPOSED STUDY OF POTENTIAL GROUND-WATER SUPPLIES, GALLUP AREA, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W76-03905

WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES, VOL 11,
Economic Research Service, Washington, D. C., Natural Resources Economic Div.
For primary bibliographic entry see Field 6E.
W76-03916

6E. Water Law and Institutions

LEGAL CONSTRAINTS ON THE USE OF WASTEWATER FOR FOOD AND FIBER,
Virginia Polytechnic Inst. and State Univ., Blackburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
In: Wastewater Use in the Production of Food and Fiber -- Proceedings, March 5-7, 1974, Oklahoma City, Oklahoma, p 330-343, 39 ref.

Descriptors: *Waste water disposal, *Legal aspects, *Irrigation programs, Foods, Fibers(Plant), Legislation, Sewage effluents, Waste water treatment, Governments, Federal government, Local government, Land use, Surface waters, Groundwater, Water quality, Planning, Design, Wastes, United States.

The recycling of municipal sludges and effluents on land has been used more extensively in other parts of the world than it has in the continental United States; therefore, this alternative for waste disposal has not had an in-depth evaluation in the United States relative to other methods. Legal aspects covering land disposal of effluents are examined, including Federal and State regulations, land use policies affecting the application of waste water, and legal constraints on land application of waste water that may result from alteration of surface and groundwater quality and flow patterns. Consideration of potential legal constraints must be an integral part of the planning and design of systems for applying waste water to land. Because of the nature of these constraints, they cannot be treated as final design considerations, but must be kept in mind from the initiation of planning. Failure to give complete and timely recognition to these constraints is likely to produce problems during the operational stage and result in inefficiency and frustration in the application of the concept. (See also W76-03541) (Witt-IPC)
W76-03562

A PROGRESS REPORT ON THE INTERNATIONAL CONVENTION ON CIVIL LIABILITY FOR OIL POLLUTION DAMAGE AND ITS SUPPLEMENTARY FUND CONVENTION,
Office of the Judge Advocate General (Navy), Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-03584

THE FEDERAL WATER POLLUTION CONTROL ACT AND FORESTRY,
National Forest Products Association, Washington, D.C. Environmental Quality Dept.
For primary bibliographic entry see Field 5G.
W76-03586

A SUGGESTED STATE FOREST PRACTICES ACT (MECHANISM FOR IMPROVING WATER QUALITY ON FOREST LANDS),
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-03587

INDIAN PRIOR AND PARAMOUNT RIGHTS VERSUS STATE RIGHTS (INDIAN WATER RIGHTS),
Bureau of Indian Affairs, Washington, D. C.
W. H. Veeder.
North Dakota Law Review, Vol 51, No 1, p 107-136 (1974). 30 p, 161 ref.

Descriptors: *Indian reservations, *Water rights, *Legal aspects, Jurisdiction, *Federal jurisdiction, *State jurisdiction, *Federal-state water rights conflicts, Irrigation, Pueblo water rights, Water law, Constitutional law, Arid lands, North Dakota, South Dakota, Montana, Idaho, Washington, Federal Government, State governments, Public rights.
Identifiers: *Western States.

This article discusses the police power of the states in connection with Indian Reservations and Indian water rights. Particular concern is focused on the arid and semi-arid Western States. After examining the legal history of Indian rights, the author concludes that the police power of the States may not be extended to affect Indian water rights. Several reasons support this conclusion: (1) the unbroken line of decisional law; (2) the will of Congress expressed in the Enabling Acts admitting Western States into the Union; (3) the Constitutional disclaimers imposed as conditions to state admission (under which the States renounced all claims to Indian lands); and (4) the overriding Trust obligation of the United States to preserve and protect the 'Indian Winters Doctrine' rights to the use of water in the arid and semi-arid West. The author states that the primary reason for the violation of Indian rights by the States has been the avidity for water in the Western States and the failure of the United States to prevent those violations. (Nursey-Florida)
W76-03588

'IT'S OUR WATER'--CAN WYOMING CONSTITUTIONALLY PROHIBIT THE EXPORTATION OF STATE WATERS,
Wyoming Univ., Laramie. Water Resources Research Inst.
G. A. Zunker.
Land and Water Law Review, Vol 10, No 1, p 119-146 (1975). 28 p, 156 ref.

Descriptors: *Wyoming, *Legislation, *Interst compacts, *Water rights, *Judicial decisio Regulation, State governments, Water contrac Water utilization, Interstate, Water users, Wa allocation(Policy), Federal government, Permi Legal aspects, Jurisdiction, Constitutional l Water, Water law.
Identifiers: *Wyo. Stat. S 41-10.5, State policy.

A 1974 Wyoming Statute designed to preserve state's waters for its inhabitants prohibits the portation of Wyoming waters without spec authorization by the state legislature. This art examines the constitutionality of that statute. rently there are two divergent views of water natural resource. One gives a state virtually limited control over its water where inters commerce is involved. The other treats water any other natural resource and does not permit state to restrict its use in interstate commerc any greater degree than is permitted for o natural resources. Most arguments in suppor statutory restrictions which have been pl upon the use of water outside the state are b on the concept that all property interest in waters of the state is vested in the state. Cou arguments, however, say the issue is not on property or ownership, but of accommodatin competing demands of the state and nationa terests involved. (Parrish-Florida)
W76-03589

HOW NOW BROWN COW: REGULATION FEEDLOT POLLUTION IN WISCONSIN,
Harvard Law School, Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-03590

LAW OF THE SEA - EXCLUSIVE ECONO ZONE (DISCUSSION OF FISHERIES JURIS TION CASE),
J. G. Weil.
Harvard International Law Journal, Vol 16, p 474-490, (1975). 7 p, 64 ref.

Descriptors: *Law of the Sea, *Commercia ing, *Boundary disputes, Foreign cou *Foreign waters, Jurisdiction, Treaties, F trade, Legal aspects, Economic impact, I benefits, Government finance, Natural reso Fish conservation, Fish management, P aspects, Governments, Governmental int tions.
Identifiers: *Iceland, *United Kin *Fisheries jurisdiction, Doctrine of prefe rights.

The Fisheries Jurisdiction Case developed dispute between the United Kingdom and over fishing rights in waters adjacent to the dic coast. The dispute was touched off wh land announced its intention to extend its sive fisheries jurisdiction to 50 nautical m 1974 the International Court of Justice a jurisdiction of the dispute. The court foc two issues: whether Iceland's unilateral ex of its exclusive fisheries jurisdiction in viol a 1961 agreement was valid against the Kingdom; and whether Iceland and the Kingdom are under a mutual duty to neg conservation regime to protect the resources in the disputed waters. The vehi by the Court to resolve these issues was t developed doctrine of preferential rig functional substance of this doctrine developed through negotiations by the di themselves. In this case, the Court instru negotiating parties to consider the prefer Iceland as a coastal state, the United Ki time-honored economic interest in the the interests of the entire world in the c tion of resources. (Hoffman-Florida)
W76-03591

ED STATES ENVIRONMENTAL LAWS
EXPLORATION AND PRODUCTION
ATIONS,
ic Richfield Co., Dallas, Tex. North Amer-
roducing Div.
imary bibliographic entry see Field 5G.
3592

ERNIZING STATE WATER RIGHTS
: SOME SUGGESTIONS FOR NEW
CTIONS,
nia State Water Resources Control Board,
nento.
obie.
Law Review, Vol 1974, No 4, p 760-784
25 p, 129 ref.

ptors: *Water resources development,
rights, *State jurisdiction, *Water alloca-
licy), *Administrative decisions, Legal
, Water law, Administrative agencies, Ad-
ation, Planning, Water policy, Stream flow,
waters, Water resources, Subsurface
Social impact, Management, Long term
g.
ers: *Public interests, Water rights institu-

ization of water rights institutions will
nore extensive state involvement and dis-
in the allocation of water. Any suggested
s must rest on three general principles: (1)
ights laws must recognize public needs and
oals; (2) water rights administration must
planning for the total water resource; and
system must maximize water conservation.
ed here are suggested changes in laws in
areas, including: maintenance of minimum
lows; provisions for public access to water
es; broadening the concept of 'public in-
developing a broadly based water
es plan to guide in the allocation of water
es; establishing a single legal system for
and underground water; making a full en-
ntal analysis a part of every states 'water
w; and making water rights sufficiently
to provide for changing public values and
ns. One change proposed in the adminis-
area would provide procedures for op-
allocation of the total water resource
assuring that the water appropriated is
its maximum efficiency. (Hoffman-
93

APPROACH TO INTERNATIONAL EN-
MENTAL COOPERATION; THE NATO
TTEE ON THE CHALLENGES OF
N SOCIETY,
mental Protection Agency, Washington,
ary bibliographic entry see Field 5G.
94

LOOKS AT WATER CLEANUP
MS AND PROSPECTS.
ary bibliographic entry see Field 5G.
96

ASSIFICATIONS ADOPTED AND AS-
TO CERTAIN WATERS IN THE YAD-
ER BASIN.
rolina Environmental Management Com-
Raleigh.
ary bibliographic entry see Field 5G.
98

NCE AMENDING THE COMPREHEN-
NING ORDINANCE NO. 3011 (FOR
HAZARD PROTECTION, FORT
TEXAS).
th, Tex.
ary bibliographic entry see Field 6F.
99

INDIANA DUNES NATIONAL LAKESHORE (S 820).
Hearing--Subcomm on Parks and Recreation, Comm on Interior and Insular Affairs 93d Cong 2d Sess, Sept 30, 1974. 298 p, multi photo.

Descriptors: *National Lakeshores, *United States, *Seashores, *Conservation, Legal aspects, Water law, Competing uses, Economics, Water conservation, Natural resources, National Parks, Protection, Water resources development, Water quality, Water quality control, Industries, Farming, Lakes, Environmental effects, Land use, Economic impact, Social aspects, Water utilization, Indiana.
Identifiers: *Indiana Dunes National Lakeshore, Senate Subcommittee on Parks and Recreation, Congressional hearings.

Considered here is a proposed amendment to the act establishing the Indiana Dunes National Lakeshore. The amendment would provide for the addition of approximately 5230 acres to the lakeshore. Testimony includes statements from Senators Bayh, Hartke and Percy, three of the Bill's sponsors, and from environmental and conservation groups, in favor of the amendments and from business and farming groups generally opposed to the amendment. A letter from the Department of the Interior states the Department's position that the addition of acreage to the lakeshore is not of national significance nor necessary for the primary purpose of the lakeshore; and furthermore, there is already a great existing demand for funds to acquire areas previously authorized in the National Park System. (Nursey-Florida)
W76-03600

STEAM ELECTRIC POWER GENERATING POINT SOURCE CATEGORY--PROPOSED EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-03601

MEAT PRODUCTS POINT SOURCE CATEGORY--SMALL PROCESSOR SUBCATEGORY; EFFLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washington, D..
For primary bibliographic entry see Field 5G.
W76-03602

MEAT PRODUCTS AND RENDERING PROCESSING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-03603

GRAIN MILLS MANUFACTURING POINT SOURCE CATEGORY--EFFLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-03604

PLANNING ASSISTANCE TO STATES (TO AID IN PREPARATION OF COMPREHENSIVE PLANS FOR WATER AND RELATED RESOURCES).
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-03605

INTERVENTION ON THE HIGH SEAS ACT.
PL 93-248; 88 stat 8, US Code Cong and Admin News, p 9-12, 1974, 4 p.

Descriptors: *Disasters, *Navigation, *Oil spills, *Legislation, *Federal jurisdiction, Comprehensive planning, Governmental interrelations, Water pollution effects, Environmental effects, Aquatic life, Wildlife, Oil wastes, Oily water, Oil, Water pollution sources, Decision making, Law enforcement, Penalties(Legal), Oil pollution, Hazards, Costs.
Identifiers: *Intervention on the High Seas Act, *Liability.

Whenever a ship collision or other incident of navigation creates a grave and imminent danger of oil pollution to the coastline or related interests of the United States, the Secretary of the department in which the Coast Guard is operating may take such measures on the high seas are necessary to prevent, mitigate, or eliminate that danger. Furthermore, any action so undertaken shall be without liability for any damage to the owners or operations of the ship, to her cargo or crew, or to underwriters or other parties interested therein. In determining if there is a grave danger the Secreary shall consider such interests as fish, wildlife, estuarine activities, and public and private shorelines and beaches. Procedures are laid down for implementing any type of action under this Act. However, the Secretary is authorized in cases of extreme urgency to take necessary action without any type of notification or prior consultation is required by normal procedure. Civil and criminal penalties are provided to aid in the enforcement of this Act. (Hoffman-Florida)
W76-03606

UNITED STATES V. SMITH (DREDGING AND FILLING MARSHLAND WITHOUT CORPS OF ENGINEERS PERMIT).
5 ELR 20382-20383 (ED Va, 1975), 2 p.

Descriptors: *Rivers and Harbors Act, *Dredging, *Wetlands, *Landfills, *Federal Water Pollution Control Act, Permits, Tidal effects, Navigable waters, Bulkheads, High water mark, Marshes, Federal jurisdiction, Environmental effects, Penalties(Legal), Streams, Construction, Tidal waters, Judicial decisions, United States.

Defendent landowner had dredged a creek, filled in marshlands adjacent to his property, and constructed a bulkhead below the mean high water line without a permit from the Corps of Engineers. Because no permit was obtained, the United States brought this action for injunctive relief and civil penalties pursuant to the Rivers and Harbors Act of 1899 and the 1972 Amendments to the Federal Water Pollution Control Act. The court found it had jurisdiction over the subject matter and the parties to the action by virtue of findings of fact that Stutts Creek is a navigable water of the United States. Since the creek was a navigable water, the dredging and construction of a bulkhead constituted a violation of the Rivers and Harbors Act of 1899. The marsh wetlands were found to be 'water of the United States' under the 1972 Amendments to the FWPCA because they were, under normal conditions, inundated by the tides. Thus the defendant's landfill activities constituted a discharge into the 'waters of the United States' in violation of 301 and the 1972 Amendments. Consequently, the court granted appropriate injunctive relief. (Hoffman-Florida)
W76-03607

UNITED STATES V. SEXTON COVE ESTATES, INC. (ORDER REQUIRING DEVELOPER TO RESTORE WETLAND MODIFIED WITHOUT CORPS OF ENGINEERS PERMIT).
5 ELR 20348-20353 (SD Florida, 1975), 6 p.

Descriptors: *Florida, *Rivers and Harbors Act, *Canals, *Navigable waters, *Canal construction, Judicial decisions, Water permits, Water law, Penalties(Legal), Tidal waters, Mangrove swamps, Inland waterways, Navigation, Water rights, Governments, Legal aspects.
Identifiers: Private property.

In an action brought under the River and Harbors Act of 1899, the court ordered a developer who commenced canal building and modification without a Corps of Engineers permit to restore pre-existing canals, plug and fill in canals it constructed, and replant the mangrove fringe along the banks of the restored canals. The court held that man-made canals on private property become navigable waters of the United States and thus subject to the Act's permit requirements when connected to tidal water, even if they are subsequently plugged at their seaward ends. The court also held that a canal is a 'structure' within the meaning of the statutory provision authorizing injunctive relief to prevent the construction or seek the removal of an unlawful structure. Neither equitable estoppel nor laches precluded the government from enforcing that statute by seeking such relief in this case. The developer was enjoined from selling any property at the development site without the prior approval of the court until the mandate restoration has been accomplished. (Hoffman-FLORIDA)
W76-03608

CHICAGO REGIONAL PORT DISTRICT ACT.
Ill Ann Stat ch 19 sect 152 thru 178 (Smith-Hurd), 24 p.

Descriptors: *Port authorities, *Illinois, *Adminstrative agencies, *Administrative decisions, *Legislation, Economics, Regulation, Legal review, Water policy, Water management(Applied), Bond issues, Financing, Administration, Water resources development, Navigation, Ships, State governments, Standards, Costs, Adoption of practices.
Identifiers: *Port districts, Economic controls.

This Act creates the Chicago Regional Port Districtand confers upon it specified duties, rights and powers. The Act also provides procedures and rules which must be followed concerning the operation of public warehouses and other storage facilities owned and controlled by the District. Economic controls are put on the District in that it can not incur any oblications until the necessary appropriations have been made. In order to facilitate orderly operations, the District is given the power to make any transactions concerning real property that are necessary to the development of the port area. Because of the large amount of capital needed to run the port, the District is also given the power to issue bonds to finance required purchases. The Act makes it clear, however, that such bonds shall not become obligations of the State of Illinois. The Act also details regulations governing the administrative operations of the Chicago Regional Port District Board. Finally, the Act provides that all final administrative decisions of the Board will be subject to judicial review. (Hoffman-Florida)
W76-03609

PEOPLE OF CALIFORNIA EX REL. STATE WATER RESOURCES CONTROL BOARD V. ENVIRONMENTAL PROTECTION AGENCY (ACTION TO REQUIRE EPA TO NOT EXEMPT FEDERAL AGENCIES FROM PERMIT PROGRAMS).
511 F2d p 963-975, (9th Circuit 1975), 16 p.

Descriptors: *State jurisdiction, *Federal Water Pollution Control Act, *Washington, *California, *Judicial decisions, Governmental interrelations, Legislation, State governments, Permits, Legal aspects, Water law, Federal jurisdiction, Environmental effects, Regulation, Clean Air Act, Water pollution, Water pollution control, Water pollution sources, Control.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, Federal agencies, State policy, Administrative regulations.

Appellants, state governments, appealed from decision of appellee, Administrator of the Environmental Protection Agency (EPA), to exempt federal agencies from compliance with state permit programs regulating pollution control. Under the Federal Water Pollution Control Act (FWPCA), state governments assume primary responsibility for implementation of the National Pollutant Discharge Elimination System. The EPA Administrator exempted federal facilities, which discharge pollutants into navigable waters, from compliance with any state permit program. The Ninth Circuit Court of Appeals held this to be error, concluding that federal agencies are required to comply fully with all aspects of state water pollution permit programs. In finding a Congressional intent to subject federal facilities to state regulation under the FWPCA, and to rely on state governments to enforce the Act, the court directed the EPA Administrator to reconsider the applications of the appellant states, to the extent he previously rejected their proposed programs. (Jenkins-Florida)
W76-03610

SPRINGER V. JOSEPH SCHLITZ BREWING COMPANY (DIVERSITY ACTION BY OWNERS OF DOWNSTREAM FARM ALLEGING DISCHARGE INTO MUNICIPAL TREATMENT FACILITY WHICH CAUSED OVERLOAD AND POLLUTION).
510 F 2d p 468-479, (4th Circuit 1975), 12 p.

Descriptors: *North Carolina, *Judicial decisions, *Negligence, *Penalties(Legal), *Municipal wastes, Local governments, Riparian rights, Industrial wastes, Wastes, Water pollution, Water pollution sources, Rivers, Waste disposal, Waste treatment, Waste water(Pollution), Waste water treatment, Water pollution effects, Legislation.
Identifiers: Injunctive relief, Immunity.

Plaintiff, downstream riparian landowners, sued in federal district court for injunctive and monetary relief for defendant brewery's discharge into a municipal treatment facility. The discharge allegedly overloaded the city's sewage treatment plant, causing pollution of a river bordering plaintiff's property. In a case of first impression, the Fourth Circuit Court of Appeals held that the violation of a municipal sewage ordinance can subject industrial sewage sources to a private tort action. Failure to obtain a permit for waste discharge is not actionable without proof that the discharge contained a prohibited level of pollution and that such pollution proximately caused damage to riparian rights. Both issues are for the jury to decide. The court also ruled that where the industrial user knows or has reason to know that municipal facilities cannot adequately treat its waste, the general rule that a user is immune from prosecution because of the city's negligence does not apply. Under state law, an employer is liable for the negligent acts within his control even where an independent contractor is also at fault. The case was remanded for a new trial on both theories of liability. (Jenkins-Florida)
W76-03611

NATURAL RESOURCES DEFENSE COUNCIL, INC. V. TRAIN (ACTION BY ENVIRONMENTAL GROUP TO COMPEL PUBLICATION OF EFFLUENT GUIDELINES BY THE ENVIRONMENTAL PROTECTION AGENCY).
510 F 2d p 692-731 (District of Columbia Circuit 1975), 40 p.

Descriptors: *Judicial decisions, *Environmental control, *Pollutants, *Administrative agencies, *Regulation, Administrative decisions, Jurisdiction, Legal aspects, Legislation, Legal review, Environmental effects, Environmental engineering, Administration, Law enforcement, Water pollution, Water pollution sources, Water pollution control.
Identifiers: Injunctive relief, Natural Resources Defense Council, Federal Water Pollution Control Act Amendements of 1972, Point-source pollution, Administrative regulations, Effluent limitations.

Plaintiff, Natural Resources Defense Cou sued in federal district court to compel defend Environmental Protection Agency and its ministrator, to publish effluent limit guidelines required by section 304 (b)(1)(A) o 1972 Federal Water Pollution Control Act Am ments. Defendant appealed from an ad judgement, arguing that the deadline for pul tion of guidelines did not include all categori point-source pollution, but only those specif section 306 (b)(1)(A). Defendant also argued plaintiff's failure to comply with the r requirement of the private citizen's suit pro was a fatal jurisdictional defect. The Circuit held that failure to give notice did not defeat tiff's claim. Neither the general federal qu statute not the Administrative Procedure require prior notice to the administrator court affirmed the lower court's order guidelines for all point-source pollutan published within a year, but modified the or allow the Administrator to petition for an sion of the deadline should publication of ticular category by that date be infe (Jenkins-Florida)
W76-03612

PEOPLE V. TEXACO, INC. (SUIT CHAR VIOLATION OF COUNTY FIRE PROTE ORDINANCE IN UNLOADING GAS BARGE IN NAVIGABLE WATERS).
365 NY S2d 661-670 (District Court, Nassau ty, 1975), 10 p.

Descriptors: *Navigable waters, *Govern interrelations, *Tidal waters, *State jurisd Judicial decisions, Regulation, Penalties(Legislation, Harbors, Water policy.

Defendant was charged with violating a fire prevention ordinance concerning u gasoline from his barge. One of the issues was whether the Nassau County fire mars jurisdiction overs water contiguous to the The court found that title to tidal waters ways been vested in the sovereign for the good. The state legislature thus had the tive to confer upon local municipalities th regulate their abutting navigalbel and tida The court found that such a right was c upon Nassau County under section 2 Navigation Law. Since the county had th regulation, it had the authority to provide ments and penalties with respect to acti the navigable water. (Hoffman-Florida)
W76-03613

HACKENSACK WATER COMPANY V (APPEAL FROM CONDEMNATION DOWNER'S PROPERTY FOR CONSTR OF WATER RESERVOIR).
333 A2d p 544-552 (Superior Court of the sey, 1975), 9 p.

Descriptors: *New Jersey, *Cond *Easements, *Flooding, Water law, Leg State governments, Administrative Flood damages, Dams, Reservoirs, Rese struction, Water storage, Compensation domain, Legal review, Project planning, water, Flood frequency.
Identifiers: *Dam effects, Administrati tion.

Appellant water company sought ap condemnation of respondent landowne ty, to construct a water reservoir. The was approved in part and denied in part dent water policy and supply council, that respondent landowners should gra an easement for periodic flooding of respondent's property. The water comp that the council's findings of fact were and unsupported by the evidence. T Court of New Jersey, Appellate Divisio the council has implied authority to sa

ıation of an easement, rather than a fee in-
t, where chronic, serious, or frequent flood-
s unlikely. Occasional or periodic flooding
constitute an injury to land rather than a per-
nt taking or appropriation. However, such in-
must be redressed through an award of just
ensation. Thus, the court ruled that condi-
g approval upon the landowners' execution
agreement to hold appellant harmless from
ges for flooding was improper. (Schilling-
la)
)3614

RTMENT OF NATURAL RESOURCES V.
PPER (ACTION TO ENJOIN CONSTRUC-
OF HOUSE BETWEEN MEAN HIGH-
ER LINE AND DUNE LINE).
2d p 644-646 (Court of Appeals of Maryland
3 p.

ptors: *Maryland, *Prescriptive rights,
hes, *Land use, State governments, Ad-
rative agencies, Water law, Legal aspects,
, Coasts, High water mark, Land resources,
l decisions, Public rights, Public access,
s.
iers: *Dedication, Injunctive relief, State
Evidence.

ff Department of Natural Resources
t action to enjoin defendant landowner
onstructing a house in the dry sand area of
an front tract between the mean high water
d the dune line. The Department argued that
a between the mean high water line and the
ne has been dedicated to the public, and
e public had attained prescriptive rights to
a. The trial court dismissed the bill of com-
pointing out that defendant held permits
ıe appropriate city and county authorities.
urt of Appeals of Maryland affirmed, hold-
t there had been no dedication of the pro-
ı question, since there was no evidence of
ention to dedicate. Since there was no
e of continued and uninterrupted adverse
twenty years, the court denied plaintiff's
hat the public had acquired prescriptive
Schilling-Florida)
615

S COUNTY DRAINAGE AND CONSER-
N DISTRICT NO 2 V. BEVLY (SUIT TO
ENLARGEMENT OF EXISTING
AGE DITCH).
2d, p 938-953 (Court of Civil Appeals of
975), 16 p.

tors: *Texas, *Eminent domain,
tutional law, *Channel improvement,
damge, Local governments, Administra-
ıcies, Water law, Legal aspects, Drainage,
ıuting, Floods, Drainage systems, Chan-
rosion, Ditches, Common law, Water
nent(Applied), Judicial decisions.
rs: Sovereign immunity, Injunctive relief.

landowner sought to permanently enjoin
rgement of an existing drainage ditch,
partly within the defendant drainage and
ıtion district. Plaintiff contended that en-
he ditch would irreparably damage his
ıugh increased flooding and erosion. The
rt granted injunctive relief on the ground
rging the ditch would result in the 'taking'
iff's property in violation of the Texas
ion. The court of civil appeals reversed,
hat the ditch enlargement did not con-
'taking' of plaintiff's property since there
no physical invasion or appropriation of
Thus, any injury to plaintiff's property
a 'damaging' rather than a 'taking' in the
ional sense. The court stated that even
he district could not exercise eminent
ı appropriate land outside its boundaries,
nake improvements which might damage
. Where the proposed ditch improvement
was permanent and lawful, it could not be enjoined. Rather, plaintiff was limited to damages as a remedy. (Schilling-Florida)
W76-03616

DEPARTMENT OF NATURAL RESOURCES V. LINCHESTER SAND AND GRAVEL CORP (APPEAL BY LANDOWNER FROM DENIAL OF PERMIT TO DREDGE AND FILL PRIVATE WETLANDS).
334 Atlantic Reporter, 2 d Series, p 514-526 (Court of Appeals of Maryland, 1975), 13 p.

Descriptors: *Maryland, *Wetlands, *Constitutional law, *Admininstrative agencies, Adjudication procedures, Dredging, Permits, Judicial decision, Legal review, Administration decisions, Legislation, Administration, Legal aspects, Water, Water law, Environmental effects.
Identifiers: Administrative law, Fill permits.

Landowner's application for a dredging permit on private wetlands was denied by the Secretary of the Department of Natural Resources (DNR) and the denial was affirmed by the Department board of review. The landowner then appealed the board's decision to the circuit court pursuant to Maryland's 'wetlands statute' which provides a de novo jury trial. At trial the jury was permitted to determine the ultimate quesion of whether the permit should be granted. From a decision granting the landowner a permit, the DNR appealed, contending that the scope of judicial review allowed by the statute was an unconstitutional usurpation of the traditional division of powers between the legislative and judicial branches. The Court of Appeals remanded the case, holding that the section providing for a de novo trial was unconstitutional. The court held that when an administrative agency is acting in a fact-finding capacity, the courts review is limited to determining whether the decision was rendered in an illegal, arbitrary, capricious, oppressive or fraudulent manner. Under the Maryland statute, the scope of review was impermissible since it allowed the court to substitute its own judgement for that of the agency. (Hoffman-Florida)
W76-03617

HOLIDAY INNS, INC. V. POLLUTION CONTROL BOARD (PETITION FOR REVIEW OF ORDER DENYING VARIANCE FROM WATER POLLUTION RELATIONS REGARDING EFFLUENT).
327 NE2d, p 364-368 (5th DCA Illinois, 1975), 5 p.

Descriptors: *Illinois, *Sewage effluents, *Waste water disposal, *Water quality standards, Judicial decisions, Sewage disposal, Environmental sanitation, Sewage treatment, Regulation, Wastes, Water pollution sources, Water pollution, Disposal, Public health, Water, Water law, Legal aspects, Environmental effects.

The petitioner operates a motel complex in a sparsely population area. Petitioner's application for a variance from water pollution regulations regarding effluent standards was denied by the Pollution Control Board (PCB). The petitioner appealed that decision, contending it was arbitrary and capricious. The petitioner relied on the fact that it was proceeding with reasonable speed to construct an adequate pollution treatment facility. In reviewing the order of the PCB, the court noted that it was required to sustain the order if it was supported by creditable evidence. The court also observed that petitioner's argument that no public hazard was involved because of the motel's location, and that an effort to comply with regulations was in progress, would be appropriate to an enforcement proceeding. Despite these two observations, the court dismissed the appeal, finding the issue to be moot, since the period of time for which the variance could have been granted had expired. (Hoffman-Florida)
W76-03618

FISHING REEFS IN OFFSHORE WATERS.
Alabama Code, Tit 8, Sections 171(23)-171(25) (Cum Supp 1973), 2 p.

Descriptors: *Fishing, *Reefs, *Alabama, Marine fisheries, *Mississippi, *Florida, Federal government, Salvage value, Conservation, Marine fish, Resources, Resource development, Public benefits, Water, Water law, Legal aspects, Legislation, Governmental interrelations.
Identifiers: *Artificial reefs, *Liberty ships, Coastal waters, Offshore waters.

The federal government made available to the states of Alabama, Mississippi and Florida fifteen liberty ships for the purpose of establishing artificial fishing reefs in the states' coastal waters. This part of the Alabama code provides that the money realized from any salvagable parts of the vessels shall be used by the division of marine resources in preparing the vessels for submersion. It further creates a fishing reef ship commission and provides that the commission members be reimbursed for their actual expenses while conducting the business of the commission. (Parrish-Florida)
W76-03619

INNOCENT PASSAGE: AN HISTORICAL AND ANALYTICAL PERSPECTIVE,
North Carolina Univ. at Chapel Hill.
C. Fagan.
In: Some Current Sea Law Problems, Sea Grant Publication UNC-SG-75-06, p 1-13, Feb, 1975, 13 p, 76 ref.

Descriptors: *Law of the Sea, *International law, *Straits, *Navigation, *Foreign waters, Military aspects, International waters, Law enforcement, Jurisdiction, Governments, Foreign countries, Governmental nterrelations, Ships, Conferences, Routing, Navigation, Coasts.
Identifiers: *Innocent passage(Navigation), Territorial sea.

Innocen passage is the right granted to certain maritime vessels freely to navigate the sovereign territorial sea of another state, as long as the passage imposes no undue harm upon the littoral state. This unrestricted right is granted only to commercial vessels, warships being subject to considerable restrictions and limitations. The passage must be one of continuous navigation and does not include putting into port. The historical basis and development of the concept of innocent passage is traced from its beginnings in ancient maritime commerce through the recent international law of the sea conferences. The sections pertaining to innocent passage in the Hague and Geneva conventions are closely analyzed to illuminate their respective strengths, weaknesses, and areas of possible future conflicts. The major problem area inhibiting the international codification of territorial sea boundaries, that of guaranteed commercial and military passage through maritime straits, is outlined here along with other issues to be debated in the next Law of the Sea Conference. (Hoffman-Florida)
W76-03620

THE U.S. POSITION ON THE BREADTH OF THE TERRITORIAL SEA: NATIONAL SECURITY AND BEYOND,
North Carolina Univ. at Chapel Hill.
K. Hedman.
In: Some Current Sea Law Programs, Sea Grant Publication UNC-SG-75-06, Feb, 1975. 12 p, 68 ref, p 14-25.

Descriptors: *Military aspects, *Law of the Sea, *International law, *Federal jurisdiction, *Straits, Judicial decisions, Water law, International waters, Foreign countries, Ships, Navigation, Governments, Governmental interrelations, Jurisdiction, Channels, Inland waterways, Conferences, Foreign waters, Legal aspects, Political aspects, Coasts.

Identifiers: *Territorial sea, Innocent passage, Free passage(Navigation), Coastal states.

Since 1793 the United States has recognized a distance of three geographical miles as the extent of the breadth for the territorial sea. The Anglo-Norwegian Fisheries Case undermines the U.S. position. That case is interpreted as encouraging all states to determine for themselves within reasonable limits the width of their own territorial zones. Why the United States continues to cling to the three-mile breadth when most other nations have expanded their jurisdiction is not clear. The major motivation behind United States policy seems to be national security. If a twelve-mile breadth was recognized, coastal states that felt their security threatened could cripple the passage of United States forces through vital international straits, and be completely within their rights under international law. In 1970, President Nixon outlined proposals that provided for a twelve-mile territorial sea, a right of unimpeded transit for all ships, and unimpeded overflight for all aircraft, through and over international straits. These proposals were submitted at the 1974 Caracas Law of the Sea Conference. A group of coastal states bordering on important international straits offered alternate proposals that would allow them to regulate the passage of nuclear powered ships and to continue to require notification for the transit of warships. No acceptable compromise was reached. (Hoffman-Florida)
W76-03621

STARE DECISIS IN THE DEVELOPING LAW OF THE SEA,
North Carolina Univ. at Chapel Hill.
D. H. Rogers.
In: Some Current Sea Law Problems, Sea Grant Publication, UNC-SG-75-06, p 53-64, Feb 1975. 8 p, 46 ref.

Descriptors: *Law of the Sea, *International Law, *Legal review, *Judicial decisions, Water law, Law enforcement, Foreign water, Treaties, Legal review, Legal aspects, International commissions, International waters, Regulation, Governments.
Identifiers: *Stare decisis, *International Court of Justice(ICJ).

Legal stability, one of the attributes stemming from the principle of stare decisis, is urgently needed in the emerging law of the sea. Much of this stability will be achieved through an elaboration of conventional international law. The International Court of Justice (ICJ) at the Hague, will also play a vital role in providing stability. Four different cases have been fully or partly resolved by the ICJ, which, when taken together, begin to establish a rudimentary body of case law in this area. They are the Fisheries Cases of 1951; The Minquiers and Ecrehos Case of 1953; The North Sea Continental Shelf Cases of 1969; and The Fisheries Jurisdiction Case of 1974. Article 59 of the ICJ Statutes states that '(T)he decision of the Court has no binding force except between the parties and in respect of that particular case.' Nevertheless, the in-depth analysis provided of the four above cited cases suggests that the seed of the doctrine of stare decisis has been implanted in the minds of the judges of the ICJ. (Hoffman-Florida)
W76-03622

THE EMERGENCY MARINE FISHERIES PROTECTION ACT OF 1974, S 1988,
North Carolina Univ. at Chapel Hill.
R. W. Burris.
In: Some Current Sea Law Problems, Sea Grant Publication UNC-SG-75-06, p 65-73, Feb 1975. 9 p, 47 ref.

Descriptors: *Marine fisheries, *Fisheries, *Commercial fishing, *International law, *Fish management, *Federal jurisdiction, Legislation, Fish harvest, Aquatic environment, Foreign countries, Aquatic animals, Fishing, Fish stocking, Fish conservation, Fish reproduction, Governmental interrelations, Governments, Jurisdiction, International waters, Boundary disputes.
Identifiers: *Haddock, *Fishery jurisdiction, Tuna, Territorial sea.

The proposed Emergency Marine Fisheries Protection Act of 1974 (EMFPA) is largely a response to the depletion of a number of coastal and anadromous fishery stocks by foreign fishing interests. For example, The Russian fishing fleet in just one year of systematic concentration on the haddock reduced a strong commercial class of fish to the point that breeding stocks are feared incapable of proper repopulation. Consequently, the primary purpose of the 1974 Act is to unilaterally extend U.S. fishery jurisdiction from twelve miles to two hundred miles pending a general agreement at the United Nations Law of the Sea Conference establishing an effective international regulatory regime. There has been strong opposition to this proposed Act, however, from the State Department, the Pentagon, the tuna industry and other internationalists. These critics stress that unilateral action is not the appropriate solution as it would merely trigger an ineffectual round of diplomatic exchanges and reciprocal unilateral actions. They also fear that the legislation could prove detrimental to certain U.S. fishing interests by placing the U.S. in a possible confrontation with nations embracing the right to fish in high seas areas. (Hoffman-Florida)
W76-03623

INLAND BOUNDARIES OF A STATE'S ZONE.
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Coastal Zone Management.
In: Boundaries of the Coastal Zone, Memorandum, Rockville Maryland, May 20, 1975. 8 p, 17 ref.

Descriptors: *Coasts, *Boundaries(Property), *Surveys, *Comprehensive planning, Classification, Management, Legal aspects, State jurisdiction, Methodology, Legislation, Flood plains, Drainage systems, Bench marks, Ecosystems, Land management, Land classification, Land use, Grants, Government finance, Coasts.
Identifiers: *Coastal Zone Management Act of 1972, Coastal zone boundary, Coastal zone, Biophysical boundary, Land features.

The Coastal Zone Management Act of 1972 requires a state receiving program development grants to identify those boundaries of the coastal zone subject to its management program. A set of principles have been developed by the office of Coastal Zone Management (OCZM) to provide guidance with regard to acceptable delineations of landward coastal zone boundaries. The OCZM has determined three approaches acceptable for delineating a state's inland coastal zone boundary; biophysical, biophysical as a base for administrative, and multiple. A biophysical boundary can be defined in terms of natural features, such as drainage basins, flood plains, dune formations, and ecosystems. The problem with this approach is that it may require expensive, time-consuming surveys to locate and designate areas correctly. The biophysical as a base for administrative approach circumvents some of these problems by the designation of an inland boundary along a set of existing, easily located lineaments which approximate natural features and include all necessary land areas. The multiple boundary approach determines coastal zone boundaries on the basis of the different functions and resources contained within an area, and thus can delineate boundaries which physically overlap or are adjacent to one another. (Hoffman-Florida)
W76-03624

TIDAL DATUMS AND MAPPING TIDAL BOUNDARIES,
National Ocean Survey, Rockville, Md.
W. V. Hull, and C. I. Thurlow.
In: Boundaries of the Coastal Zone memoran
Rockville Maryland, May 20, 1975, 12 p.

Descriptors: *Mapping, *Boundaries(Prope
*Tidal waters, *Surveys, *Photogrammetry,
water mark, Aerial photography, Terrain anal
Management, Tides, Tidal effects, Methodo
Planning, Topographic mapping, Locating
tours, Coasts.
Identifiers: *Tidal boundaries, *Tidal da
*Interpolated water elevation.

Determination of coastal zone boundaries
prequisite to effective management and cons
tion in the coastal zone. Tide characteri
acquisition of tidal data, and the procedure
methodology employed all play important pa
mapping tidal boundaries. Tide characteristi
pend not only on the position of the earth su
moon, but also upon such factors as the conf
tion of the land bordering the water area and
viscosity. Tidal data, such as mean high
mean low water, and mean sea level can th
calculated by various arithmetic methods.
procedures for determining the desired
water line are the interpolated Water Ele
(IWE) method and the photogranmetric m
An IWE may be established if the time and
differences at two adjacent tide stations
ceptably small. In photogrammetry, radio c
is maintained with a photographic aircraft by
observer. At the desired tidal stage, the ob
tells the photographic crew to photograph
area. Detailed information of these tw
proaches is presented along with a discuss
various other problems which may arise i
boundary demarcation. (Hoffman-Florida)
W76-03625

**LEGAL ASPECTS OF TIDAL BOUNDARI
THE COASTAL ZONE,**
National Oceanic and Atmospheric Adm
tion, Rockville, Md.
E. D. Evans, Jr.
In: Boundaries of the Coastal Zone, Me
dum, Rockville, Maryland, May 20, 1975. 1

Descriptors: *Boundaries(Property), *Bo
disputes, Coasts, *Tidal waters, Intergove
tal relations, Legal aspects, State juris
Legislation, Comprehensive planning,
ment, Multi-purpose projects, Shores, A
tration, Land use, Coastal marshes.
Identifiers: *Coastal Zone Mana
*Territorial sea, *Coastal waters.

Section 305 (b) of the Coastal Zone Man
Act of 1972 requires coastal states to ide
boundaries of their coastal zones subjec
management program. For those stat
coastal zones on the oceans, the seaward
the coastal zone is defined to be the oute
the United State's territorial sea. Lateral
limits of a state's coastal zone will be de
the state's lateral seaward boundari
procedures have traditionally been availa
states to settle boundary disputes, intersta
ments and formal legal action. The landwa
dary of a state's coastal zone extends inl
the shoreline only to the extent necessar
trol the shorelands, the use of which hav
and significant impact on coastal wa
method used to determine landward b
having a relation to the water and the sh
to make the shoreline a baseline fro
horizontal measurement is made inland.
methods, together with the factual issu
tidal datums are computed, are often
tion. A substantial amount of case law
developed which should provide guid
performance in the future. (Hoffman-Flo
W76-03626

OKANAGAN WATER DECISIONS,
Simon Fraser Univ. Burnaby (British
Dept. of Geography.

rimary bibliographic entry see Field 5G.
03630

ERAL ENVIRONMENTAL LAWS AND ULATIONS,
Engineers and Constructors, Inc., Anaheim,

rimary bibliographic entry see Field 5G.
03806

SEX: EVOLVING WITH ITS DIVISIONS,
eman.
, No 5, p 13-15, October, 1975. 3 fig.

iptors: *Administration, Water works, treatment, Planning, Local governments.
fiers: Water Authorities(Great Britain), x Water Authority.

versation with Kenneth Roberts, the chief ive of the Wessex Water Authority, is re- . The Wessex Water Authority differs y from the other nine WA's in its water com- lavor, and its philosophy of evolution rather evolution. Water company philosophy is ed in the creation of the post of secretary to thority, and the handling responsibility for ion and fisheries as an on-line function of ef executive. Fisheries is a growth sport and s great public relations value. The post of ry was envisaged as a sort of father figure water authority's administration. The post veloped beacuse the Wessex authority is all to need a director of administratgion. than dictate the organizational structure, ssex Authority has consulted with the staff arious divisions before forming multi-func- divisions. Since Wessex now consists of irly autonomous multi-functional units, the arters is now considered to have a planning her than a day-to-day role. Advisory com- have been established in each division p of representatives of the local district s, the CLA, the NFU, the CBI, and the Council. The committees do not have ex- roles, but long-term planning, medium- anning, and problems are brought to the tees for their reaction before they are put uthorities for decisions. (Orr-FIRL)
811

: RESOURCES IN NORTHUMBRIA PARTICULAR REFERENCE TO THE ER WATER SCHEME,
nbrian Water Authority (England). nberland and Tyne Div.
rston, and D. J. Coats.
of the Institute of Water Engineers and s, Vol 29, No 5, p 226-241, July, 1975. 3 , 8 ref.

ors: *Water resources, *Water resources ment, Aquifers, Water demand, Reservoir ater supply, Surface waters, Estuaries, tion, Recreation, Camping, Fishing, Boat- nomic feasibility.
rs: Northumbrian River Authority, brian Water Authority, Kiedler Scheme.

ps taken by the Northumbrian River y before the Northumbrian Water y took over to meet the future demands r in the area are studied. The Kiedler heme is emphasized. The area described f about 3,580 sq miles, with a large popu- d the need for new industries. The nnual rainfall varies from about 25 inches reas to 90 inches in others. Industry and n tend to concentrate near the coast; the possibility of the reuse of water is d. When the River Authority came into eleven water undertakings had their area within the Authority area. New esti- demand that the Authority made upon er had to consider industry, public water supply, and direct abstractors, such as agriculturists and industrialists who take the water out of watercourses that pass their land. Sources of supply to meet these demands that were considered included aquifiers, desalination, estuarial barrages and surface water. It was found that surface water in the form of reservoirs would be necessary to meet the demand. Different plans were considered and the one settled on was called the Kielder Scheme. The construction period would be five years, only one reservoir would be needed and the amount of flooding would cover half the area that the other plans would. This plan had the least cost, the most flexibility, and the most environmental and social soundness. The recreational potential was evaluated and plans included camping sites, fishing, hiking, picnicking and sailing. (Pinto-FIRL)
W76-03824

NEERI ACCEPTS CHALLENGE TO REDUCE POLLUTION.
For primary bibliographic entry see Field 5D.
W76-03831

PUBLIC PARTICIPATION IN WATER POLLUTION CONTROL,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5G.
W76-03835

ULTIMATE DISPOSAL BY MEANS OF DEEP WELL INJECTION: A LEGAL VIEW,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5E.
W76-03839

WATER RIGHTS LAWS IN THE NINETEEN WESTERN STATES, VOL II,
Economic Research Service, Washington, D. C., Natural Resources Economic Div.
W. A. Hutchins.
For sale by the Supt. of Documents, GPO, Washington, D.C., 20402, Price $10.00. Miscellaneous Pub, No 1206, 1974. 756 p, Completed by H. H. Ellis and J. P. DeBraal.

Descriptors: *Water utilization, *Appropriation, *Diversion, *Beneficial use, Preferences(Water rights), Pacific Coast region, Legal aspects, Surface waters, Ground water, Irrigation, Judicial decisions, State governments, Administrative agencies, History, Classification, Riparian rights, Prior appropriation, Watercourses(Legal aspects), Water types, Arid lands, Real property, Remedies, California.
Identifiers: *Western U.S. States.

Volume two compares and contrasts the development and status of water rights law in the various western states regarding: (1) the riparian doctrine; (2) the pueblo water right; (3) ancient Hawaiian water rights; (4) watercourses of various types; (5) diffused surface waters; and (6) groundwaters such as artesian and percolating waters. While the western states generally follow the rule of prior appropriation and reasonable beneficial use of water, areas of conflict among holders of the different kinds of water rights are many. Statutes and judicial decisions of the several western states in these areas are examined, as well as the power of administrative agencies to regulate the acquisition and exercise of water rights. Developments in California supply much of the material. (See also W76-02105) (Parrish-Florida)
W76-03916

THE PORTS AND WATERWAYS SAFETY ACT OF 1972: AN EXPANSION OF THE FEDERAL APPROACH TO OIL POLLUTION,
Kelso, Spencer, Synder and Stirling, Honolulu, Hawaii.
For primary bibliographic entry see Field 5G.
W76-03917

NEEDED: A GROUND-WATER TREATY BETWEEN THE UNITED STATES AND MEXICO,
For primary bibliographic entry see Field 4B.
W76-03918

WATER AND WATERCOURSES--FEDERAL JURISDICTION--FEDERAL COMMON LAW DETERMINES OWNERSHIP OF RE-EXPOSED NAVIGABLE RIVER BEDS--BONELLI CATTLE CO. V. ARIZONA,
R. A. Hopp.
Washington Law Rev, Vol 50, p 777-793 (1975). 17 p, 83 ref.

Descriptors: *Accretion(Legal aspects), *Real property, *Ownership of beds, *Federal jurisdiction, *Watercourses(Legal aspects), Navigable rivers, Running waters, Judicial decisions, Legal aspects, Common law, State jurisdiction, High water mark, Riparian rights, Beds, Land tenure, Federal-state water rights conflicts, Water rights, Water law, Boundary disputes, Boundaries(Property).
Identifiers: *Equal footing doctrine.

Plaintiff Bonelli Cattle Company brought a quiet title action against the State of Arizona to determine ownership of newly re-emerged land purchased by plaintiff in 1955 from a federal grantee. The land had been re-exposed as a result of dredging and rechanneling of part of the Colorado River. The trial and intermediate appellate courts upheld plaintiff's claim. The Arizona Supreme Court reversed, holding that the re-emergence was caused by artificial, avulsive forces. Hence, under state law, the land belonged to the state. The United States Supreme Court reversed again holding that under federal common law of accretion, a state's ownership of the newly exposed bed of an inland navigable waterway is defeasible in favor of the riparian federal grantee, absent a showing by the state of any need to protect a public benefit or purpose. This note explores the pre-and post-Bonelli status of the equal footing doctrine, of state riparian property rights, and of federal common law effects on those rights. The reasoning in Bonelli is examined in light of prior doctrine. The author concludes that the decision represents an unwarranted and unmanageable extension of federal law into areas previously thought reserved for the states. (Hoffman-Florida)
W76-03919

WATER ALLOCATION,
Stanford Environmental Law Society, Calif.
For primary bibliographic entry see Field 4A.
W76-03920

WATER POLLUTION,
Stanford Environmental Law Society, Calif.
For primary bibliographic entry see Field 5G.
W76-03921

ENVIRONMENTAL LAW--1974 STYLE.
For primary bibliographic entry see Field 5G.
W76-03927

CORKSREW SANCTUARY: USE OF THE MARKET FOR PRESERVATION,
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 6G.
W76-03928

THE INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES: AN EXPERIMENT IN CONSERVATION,
Memorial Univ. of Newfoundland, St. John's.
P. Z. R. Finkle.

Dalhousie Law Journal, Vol 1, No 3, p 526-550 (1974). 25 p, 65 ref.

Descriptors: *Fish management, *Fisheries, *Commercial fishing, *International Joint Commission, *Trawling, Conservation, United States, Foreign countries, Boundary disputes, Legal aspects, Regulation, International law, International waters, Coasts, Management, Ships, Ports, Adoption of practices, Technology, Biology, Fish conservation, Nets, Spawning, Administration.
Identifiers: Maximum sustainable yield(Fish), International Commission for the Northwest Atlantic Fisheries(ICNAF), High seas, Mesh size(Fish nets).

The International Commission for the Northwest Atlantic Fisheries (ICNAF) was created to protect and conserve the fisheries of the Northwest Atlantic Ocean and to make possible the maintenance of a maximum sustained catch from those fisheries. In the fifteen years of its operation, the Commission has been continuously hampered by inherent flaws in its makeup. While the authority of ICNAF includes proposing fishing restrictions and regulations, each member state still retains a high degree of discretionary authority and can usually find ways of circumventing restrictions that are not to its immediate economic advantage. As for nonmember states, they are neither bound by ICNAF nor required to join, even if they fish in the ICNAF areas. Thus many ICNAF conservation measures, such as required minimum mesh sizes for trawler nets and various quota systems, have proved ineffective, resulting in the continuing depletion of many important fish species. If the Commission is to survive, it will have to develop new means for enforcing its regulations. This in turn will depend on proposals now before the Third U.N. Conference on the Law of the Sea which would significantly impair the principle of freedom of fishing on the high seas by permitting enforcement without the offending state's consent. (Parrish-Florida)
W76-03929

NAVIGABLE WATERS OF THE COMMONWEALTH OF KENTUCKY (PROPOSED WATER QUALITY STANDARDS).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-03930

NAVIGABLE WATERS OF STATE OF ARIZONA.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-03931

CRITERIA FOR THE EVALUATION OF PERMIT APPLICATIONS (OCEAN DUMPING).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-03932

AMENDMENTS TO ZONING ORDINACE FOR FLOOD CONTROL.
For primary bibliographic entry see Field 6F.
W76-03933

FLOOD HAZARD AREAS.
Vermont State Agency of Environmental Conservation, Monpelier.
For primary bibliographic entry see Field 6F.
W76-03934

GUIDELINES FOR DELINEATION OF FLOODWAYS AND FLOOD HAZARD AREAS.
Indiana State Dept. of Natural Resources, Indianapolis.
For primary bibliographic entry see Field 6F.
W76-03935

MODEL ZONING ORDINANCE FOR FLOOD HAZARD AREAS.
Indiana Dept. of Natural Resources, Indianapolis.
For primary bibliographic entry see Field 6F.
W76-03936

EASTLAKE COMMUNITY COUNCIL V. ROANOKE ASSOCIATES, INC. (ENVIRONMENTAL CHALLENGE TO CONSTRUCTION ON LAKESHORE).
513 P2d 36-56 (Wash 1973), 21 p.

Descriptors: *Washington, *Zoning, *Beds, *Navigable waters, *Environmental effects, Judicial decisions, Legal review, Permits, Construction, Legal aspects, Shores, Legislation, Environmental control, Reasonable use, Leases, State jurisdiction, Obstruction to flow.
Identifiers: *Environmental impact statements, *Building permits.

Defendant developer had used state leased submerged lands, which were adjacent to property on which an apartment was to be built, to satisfy zoning ordinance requirements. To prevent adverse ecological effects, plaintiff nonprofit corporations brought suit to enjoin the construction. Three of the numerous contentions urged by the plaintiffs were that: a required environmental impact state (EIS) had not been prepared; a permit had not been obtained under the Shoreline Management Act of 1971; and the apartment complex presented a obstruction to navigation. After the trial court denied injunctive relief, plaintiffs appealed to the Washington Supreme Court. The Court found that no permit was needed under the Act of 1971 since the construction had begun before the enactment of the Act. It also found that no obstruction was presented since the construction met the requirements governing private intrusions into navigable waters. The lower court decision was reversed, however, because the Court found that the building permit renewal was illegal in that no EIS had been prepared. The Court determined further that the renewal constituted a major action and thus the construction fell within the authority of the State Environmental Policy Act. (Hoffman-Florida)
W76-03937

WEST V. SMITH (USE OF HOUSEBOAT IN ADVERSE POSSESSION OF LAKESHORE CREATES EASEMENT IN GROSS AGAINST LITTORAL OWNERS).
511 P2d 1326-1334 (Idaho 1973).

Descriptors: *Idaho, *Littoral, *Prescriptive rights, *Easements, *Shores, Adverse possession. Banks, Access routes, High water mark, Legal review, Lake shores, Public access, Navigable waters, Transfer, Water users, Water rights, Proprietary power.
Identifiers: *Injunctive relief, Presumptions(Legal).

Plaintiff littoral owner brought suit to compel defendant, owner of houseboat either to move or to pay damages amounting to $100,000. Plaintiff contended that the houseboat constituted an undue interference with the littoral rights of lake shore property owners. Defendant, argued that the long history of the houseboat's presence at its current mooring established a prescriptive right to moor at that location. Defendant also noted that ingress and egress from the mooring site was facilitated by a public road across plaintiff's property. In affirming a denial of both injunctive relief and damages, the Idaho Supreme Court noted that a littoral owner's right of access to the lake free from all unreasonable encumberances concerns the entire shoreline; and that a houseboat permanently moored and connected to the shore does interfere with the littoral right of access. However, houseboat's satisfaction of the normal requ ments of adverse possession creates equivalent of an easement in gross for houseboat to interfere with the littoral rights of property owner. (Gray-Florida)
W76-03938

NIXON V. HUTTINGA (OCCASIONAL USE IRRIGATION DITCH AS CONSISTENT W PERMISSIVE USE AS USE BY RIGHT).
518 P2d 263-65, (Mont 1973), 3 p.

Descriptors: *Water rights, *Montana, *Stre *Ditches, *Adjacent landowners, Contracts, cial decisions, Water utilization, Diversion tures, Alteration of flow, Irrigation land, Irrig ditches, Penalties(Legal), Real property, law, Irrigation water, Diversion.
Identifiers: Warranty deeds.

Plaintiff landowners had brought a action se an injunction and damages in connection claimed right in an irrigation ditch running defendent adjacent landowner's property. tiffs contended that they had acquired the r the ditch, which connected Little Bear Creek Big Bear Creek, by virtue of a warranty deed veying water rights in Bear Creek and appur ditches. Although the ditch was in disrepair, tiffs were hoping to reopen it so they could water from Little Bear Creek to a point abov irrigation head works. At trial the district co nied the requested relief, holding that the granting plaintiffs a water right in Bear Cre not give them a water right in Little Bear Plaintiffs appealed to the Montana Su Court. In affirming, the court recognized warranty deed is usually prima facie proof title as to the property described in the d this case, however, the Court found that th mentioned no rights in Little Bear Creek S other evidence was introduced showing right, the district court was correct in plaintiff's claim. (Hoffman-Florida)
W76-03939

MORRIS V. MCNICOL (DOCTRINE OF NUM ABSQUE INJURIA).
519 P2d 7-11 (Wash 1974), 5 p.

Descriptors: *Grading, *Judicial de *Riparian rights, *Lakes, *Floods, D Soils, Vegetation, Drainage, Washington Gravels, Surface waters, Management, abatement, Shores, Control systems, land, Real property.
Identifiers: Lower riparian owners. owners, Lakefront property, Platting, S limitations.

Appellant, lower riparian owner of lakef perty, brought suit for damages and affirm lief against upland owners for damage t perty caused when a creek which emptie lake flooded due to the upland owners' r sand and gravel from their land. The lo granted summary judgement for upland The Supreme Court of Washington reve remanded, finding that the doctrine of absque injurie applied only if the up downers' use was reasonable. and reasonableness of the use was a qu material fact which should be tried. A was needed to determine whether uplan actions were the actual and proximate c pellants alleged injury. Finally a trial wa ry to determine whether an apportionm damages among the several upland ow be made, and to determine when t damage occurred and when appellan aware of it for purposes of applying the limitations. (Segall-Florida)
W76-03940

FITH V. NEW MEXICO PUBLIC SERVICE MISSION (PROVISION OF WATER BY IVISION DEVELOPER AND THE PUBLIC ITY ACT).
2d 269-72 (NM 1974), 4 p.

iptors: *Water permits, *Public utilities, Mexico, *Water distribution(Applied), l review, Judicial decisions, Water supply, conveyance, Water policy, Legal aspects, istrative decisions, Administrative agen- Adjudication procedure, Water supply pment, Water users, Public rights.

ee developer had constructed a water which provided water service to subdivi- t owners for a set monthly charge. One of owners, whose water had been cut off, an order requiring the developer to obtain a ate of public convenience and cecessity the New Mexico Public Utility Act. The per responded to this action by asserting e water system was not a public utility and re did not come under the authority of the fter a hearing, the Public Service Commis- sued the order, finding that the developer erating a public utility. On appeal the dis- urt reversed, finding that no public utility since water was not furnished 'to or for the as required by the Act. The New Mexico e Court, however, reinstated the order of lic Service Commission, finding that, since er system was essential to the subdivision s available to all lot owners of the subdivi- e Commission was justified in finding that er was being offered to and for the public. an-Florida)
941

OF STILLWATER V. OKLA WATER RCES BOARD (PERFECTION OF AL GOVERNMENTS APPROPRIATION S PASS TO UNIVERSITY).
938-947 (Okla Ct App 1974), 10 p.

ors: *Oklahoma, *Water rights, pal water, *Appropriation, *Federal-state hts conflicts, State governments, Surface Universities, Water supply, Contracts, Damsites, Streams, Streamflow, Supply s, Cities, Water users.
rs: *Administrative regulations, Water on-riparians).

city brought action for judicial review of a esources Board determination that the government had perfected its appropria- ater rights to a lake. Plaintiff contended statutory requirements for perfecting ap- on of water rights had not been satisfied, subsequent federal transfer of those s thus impossible. Defendants, university r resources board, contended the federal ent had transferred all rights to the , and that the city possessed only con- ghts granted by the university. Reversing court's decision recognizing the city's hts in the lake, the Oklahoma Court of noted that the federal government had ll requirements to appropriate the water uestion. Furthermore, by filing a notice t, and by constructing a dam, the federal nt complied with the intent of the statute to encourage quick completion rojects. The court also noted that, since ossesses neither vested water rights nor ghts, it has no claim to the water.
2

RD V. STATE (LACK OF FLOURIDA- WATER NO BASIS FOR WITHHOLD- MIT FOR WATER WORKS INSTAL-

27-730 (Comm Ct Pa 1975), 4 p.

Descriptors: *Pennsylvania, *Flouridation, *Distribution systems, *Public health, *Permits, Regulation, Judicial decisions, Legals aspects, Administrative agencies, Water treatment, Administration, Water distribution(Applied), Water storage, Water supply, Water purification, Water quality, Quality control.
Identifiers: Ministerial acts, Discretionary acts.

Plaintiffs, who were concerned about dental decay, brought this action in mandamus to compel defendant state agencies to change their regulations concerning the issuance of waterworks permits. Plaintiffs were seeking a regulation which would deny permits unless the water works companies flouridated their water supplies. As support for their claim, the plaintiffs relied on a state statute that required the defendant agencies to protect the health of the people of the state. The trial court dismissed the plaintiffs' complaint, however, holding that mandamus is proper only where the disputed act is ministerial, and not where the act is discretionary. The court found that the statute gave the administrators of the state agencies the discretion to determine if administrative regulations were harmful to public health, and that the plaintiffs had stated no cause of action on which to base relief. (Hoffman-Florida)
W76-03943

BUTLER V. BRUNO ('RULE OF REASONABLE USE' OF SURFACE WATER).
341 A 2d 735-42 (RI 1975), 8 p.

Descriptors: *Deflection, *Surface waters, *Reasonable use, *Adjacent landowners, *Runoff, Damages, Rain, Springs, Swamps, Marshes, Gravels, Sewage disposal, Sewage, Retaining walls, Drainage, Floods, Rhode Island, Hydraulic engineering, Natural flow, Civil law, Trespass, Negligence, Watercourses(Legal aspects), Water table.
Identifiers: *Legal responsbility, Depository, Servitude, Tort.

Plaintiff landowners sought damages for injury to their land, house and sewerage system resulting from adjoining landowner's deflection of surface water from his property onto their premises. The lower court applied the 'common-enemy doctrine' and found that the defendant was not liable for the damages sustained by plaintiffs because he had used reasonable care in developing his land when he put in a three foot gravel fill necessitated by the high-water table over his land. The Supreme Court of Rhode Island rejected the common-enemy doctrine and adopted the rule of reasonable use, which allows a landowner to make reasonable use of his land, and which holds him liable for damage to lands of others only when his harmful interference with the flow of surface waters is unreasonable. The case was therefore amended for a determination of the reasonableness of the defendant's interference with the flow of the surface waters. (Segall-Florida)
W76-03944

STATE GAME COMMISSION V. RENICK (COMMISSION PUBLIC PURPOSE SUFFICIENT GROUNDS TO FLOOD LAND TO CREATE EASEMENT).
342 A2d 824-27 (Pa Comm Ct 1975), 4 p.

Descriptors: *Condemnation, *Eminent domain, *Legislation, *Pennsylvania, *Easements, Construction, Dams, Wildlife, Hunting, Trapping, Water rights, Right-of-way, Real property, Land, Administrative agencies, Judicial decisions, Legal aspects.
Identifiers: Interests in land, title.

Appellant Game Commission sought by resolution to acquire the 'perpetual right, privilege and easement occasionally to overflow, flood and submerge' appelees' land in connection with construction of a dam. Appellees contention, sustained by the lower court, was that the Commission did not have authority to condemn any interest in land of lesser dignity than a fee simple absolute estate. The Commonwealth Court of Pennsylvania in reversing held that the Commission's power to acquire title to lands included the power to acquire any interest in land and was not limited to fee simple absolute. However, the grant of power to the Commission was to acquire only that interest in real estate necessary to carry out its purpose. (Segall-Florida)
W76-03945

SOUTHEASTERN COLORADO WATER CONSERVANCY DISTRICT V. SHELTON FARMS (WATER DECREES BOUND TO CALL OF THE RIVER).
529 P2d 1321-28 (Colo 1975), 8 p.

Descriptors: *Colorado, *Water rights, Rivers, *Phreatophytes, *Prior appropriation, Riparian rights, Riparian waters, Riparian lands, Bodies of water, Water law, Water, Legal aspects, State governments, Administrative agencies, Priorities, Water conservation, Water users, Water allocation(Policy), Appropriation.
Identifiers: *Colorado Water Right Determination and Administration Act.

Appellee land companies had cleared land areas bordering the Arkansas River of phreatophytes (water using plants), and on the basis of such clearing were awarded certain water rights free from the call of any senior decreed water rights on the river. Appellants, a water conservancy district and others, were objectors to appellee's water rights applications in the lower court. Appelants argued on appeal that the trial court's decree did violence to Colorado's 'first in time-first in right' water theory, and would make administration of the priority system under the Colorado Water Right Determination and Administration Act (the Act) impossible. Appellees contended that no injury to prior appropriators occurred by reason of their practice. They reasoned that, since the water in question was previously unavailable due to the existence of phreatophytes, granting it to them would harm no one and would conform with the policy of maximum utilization and beneficial conservation of water. The Supreme Court of Colorado found support for appellants' position in the Act, and noted that if the lower court decree were affirmed, the clearing of land would generate a better water right than the earliest ditch on a river. Thus the court held that all water decrees of any kind are subject to the priority system. (Schilling-Florida)
W76-03946

SUNSET IRRIGATION DISTRICT V. AILPORT (APPROPRIATION OF ADDITIONAL CREEK WATER BY DAM ENLARGEMENT).
531 P2d 1349-52 (Mont 1975), 4 p.

Descriptors: *Irrigation districts, *Dams, *Appropriation, *Water storage, *Impoundments, *Montana, Surplus water, Drainage, Lakes, Streams, Storage capacity, Jurisdiction, Rain, Ditches, Channels, Irrigation, Reservoirs, Runoff, Flooding, Beneficial use, Construction, Springs, Basins, Aquifers, Drainage districts.
Identifiers: Laches.

Plaintiff irrigation district brought suit to appropriate additional waters of a creek by enlarging an existing dam. Defendant prior appropriators resisted the appropriation and filed a cross-claim and counter-claim to require water users on an adjudicated stream to use water according to decree. The trial court granted the appropriation and denied relief on the counter-claim and cross-claim. Defendants asserted that the district's action to appropriate waters was by enlargement of an unlawful dam. The Supreme Court of Montana found that the existing dam was not unlawful; that no injury was shown to prior appropriators; that there

was surplus water to be appropriated; that the storage would benefit other users; that the proposed dam would not interfere with others; and that defendants were guilty of laches. Thus the trial court was correct in granting an appropriation of water. (Segall-Florida)
W76-03947

ALEXANDER V. CENTRAL OREGON IRRIGATION DISTRICT (IMPOSITION OF CONSTRUCTIVE TRUST ON WATER DISTRICT).
528 P2d 582-94 (Oregon Ct App 1974), 13 p.

Descriptors: *Irrigation districts, *Water rights, *Supplemental irrigation, *Costs, *Oregon reclamation, Public lands, Development, Arable land, Beneficial use, Streams, Priorities, Legislation, Deserts, Gravitational water, Adjudication procedure, Adjusted costs, Irrigation water, Water users.
Identifiers: *Constructive trusts, Fiduciary relationships, Laches, Declaratory judgements, Liens, Inchoate water rights, Vested water rights, Res judicata.

Plaintiff landowners brought suit against the state irrigation district seeking to have the supplemental water rights acquired by the district in a 1958 judicial decree impressed with a constructive trust in favor of the landowners. The lower court impressed the constructive trust and ordered the district to transfer the water rights to the landowners for $40, per acre. Since the district made no showing that plaintiffs had notice of the 1958 supplemental rights adjudication, the contention that the constructive trust should fail under the doctrine of res judicata had no merit. The district also contended that plaintiffs could not have been awarded the supplemental rights in 1958, and, therefore, no fiduciary relation could have existed. Other district arguments included: That plaintiffs should be barred by laches; that the price of $40. per acre was unreasonable; that plaintiffs should be required to pay their share of the post - 1958 improvements to the irrigation system; and that interest should be pain on the price of the supplemental water rights. All of these contentions were rejected and the constructive trust upheld by the Oregon Court of Appeals. (Segall-Florida)
W76-03948

NIENHUSER V. WHITSON (ADEQUACY OF SUBSTITUTE WATER DELIVERY SYSTEM).
528 P2d 933-34 (Colo Ct App 1974), 2 p.

Descriptors: *Water delivery, *Irrigation, *Conveyance structures, *Water rights, *Colorado, Easements, Jurisdiction, Construction, Repairing, Maintenance, Ditches, Properties, Judicial decisions, Facilities, Lateral conveyance structures, Water demand, Water users, Irrigation systems, Legal review.
Identifiers: Historical flow, Injunctions, Trash gates, Property rights.

Defendants owned land tranversed by lateral through which water from a ditch flowed onto and irrigated plaintiffs' land for many years. Pursuant to a court order, defendants constructed a substitute water delivery system across their land to continue providing plaintiffs with their historical flow of water. Plaintiffs appealed from the denial of a motion to alter the trial court's order denying an injunction and releasing a performance bond posted by defendant. The trial court found that the defendants had met their burden of proving that the substitute system was adequate and that they were complying with the original stipulation and order. These findings were conclusive upon review. In affirming, the appellate court also held that plaintiffs had not offered proof that they were not receiving their historical flow of water, and thus were not being deprived of their property rights without a hearing. (Segall-Florida)
W76-03949

TEXAS COUNTY IRRIGATION AND WATER RESOURCES ASS'N V DUNNETT (SALT WATER INJECTIONS INTO GLORIETTA SAND FORMATION NOT POLLUTANT OF FRESH WATER AQUIFIER).
527 P2d 578-84 (Okla 1974), 7 p.

Descriptors: *Injection, Freshwater, *Saline water, *Injection wells, *Aquifers, Pollution, *Oklahoma, Reasonable use, Appropriation, Damages, Evaporation, Waste disposal, Wells, Permits, Facies(Sedimentary), Sandstones, Shales, Conduits, Irrigation, Industries, Jurisdiction, Brines, Judicial decisions, Saline water intrusion, Salts.
Identifiers: *Gas wells, Due process of law, Surface owners, Surface pressure.

County Irrigation and Water Resources Association appealed an order of the Oklahoma Corporation Commission which permitted injection of salt water from gas wells into a fresh water sand formation pursuant of rules and regulations set forth by the Commission. Appellants argued that the Commission's finding that injections of salt water into the formation would not pollute the fresh water bearing aquifer overlying the formation was not supported by substantial evidence. Appellants also argued that the Commission had appropriated the formation from the surface owners without due process of law. In affirming the order, the Supreme Court of Oklahoma found that the order and findings of fact of the Commission were supported by substantial evidence, and that, since plaintiffs did not contend that they had sustained any damage as a result of the injections of salt water, under the rule of reasonable use the order was not contrary to law. (Segall-Florida)
W76-03950

COMMUNITY COLLEGE V. FOX (CLEAN STREAMS LAW OR SEWAGE FACILITIES ACT).
342 a2d 468-83 (Pa Com Ct 1975), 16 p.

Descriptors: *Pennsylvania, *Constitutional law, *Administrative agencies, *Judicial decisions, Water, Water law, Legal aspects, Sewers, Environment, Water pollution, Regulation, Permits, Environmental effects, Ecology, Water pollution control, Construction.
Identifiers: Pennsylvania Clean Streams Law, Pennsylvania Sewage Facilities Act, Pennsylvania Constitution, Environmental impact.

Appellant county authority was granted a permit to construct a sewage pipeline by the Department of Environmental Resources (DER). Contending that DER should have analyzed the indirect and long-range environmental impact of the pipeline, appellee landowners appealed the DER decision to the Environmental Hearing Board (EHB), which agreed and vacated the permit. In doing so, EHB ruled that DER should have considered certain environmental factors in addition to those included in a previous court decision construing the state's duty as trustee under the Environmental Rights Amendment of the Pennsylvania Constitution. On appeal, the Commonwealth Court of Pennsylvania held that the previous appeal to EHB fell within the Clean Streams Law, but not within the Sewage Facilities Act as argued by appellees. The court further ruled that DER had issued the permit in full compliance with the Clean Streams Law, as well as with the additional standards set forth by the court in Payne v. Kassab. Although the court admitted that further development of the geographical area could be a remote consequence of the installation of the sewer line, such a loss of open space was not the type of harm which would justify DER in refusing a sewer construction permit. (Schilling-Florida)
W76-03951

PAOLICELLI V. WOJCIECHOWSKI (ACT BY LANDOWNERS FOR DAMAGES FI CREATION OF POND ON ADJOINING LAN
333 A2d p 532-536 (Superior Court, New Je 1975), 5 p.

Descriptors: *New Jersey, *Flood dan *Adjacent landowners, *Drainage, See Water control, Water storage, Ditches, F Floods, Water law, Negligence, Soil stabiliz Seepage control, Planting management, aspects, Judicial decisions, Trespass, Comp tion, Water.
Identifiers: Injunctive relief, Intentional Damages, Nuisance.

Plaintiff landowners sought relief against dant, an adjoining landowner, contending th fendant's creation of a pond on his pr resulted in an unreasonable flow of water on tiffs' land. Finding that plaintiffs had an ad remedy of damages at law, the court denied tiffs' request for an injunction directing re of the pond. The court, noting that plaintif not have the burden of showing the ext which the wetness of their land resulted fr pond rather than natural conditions, av plaintiffs the cost of substantially remedyi adverse flooding effects and restoring the perty to its prior condition. The court awar ditional compensation for probable future a effects of the flooding, and for the reduc value of the portion of plaintiffs' property a ing the pond. However, court denied an av punitive damages, since there was not evid actual malice or wanton and willful disre the plaintiffs' rights. (Schilling-Florida)
W76-03952

CITY OF BRUCE V. EDWARDS (ACTI RECOVER DAMAGES FOR LAND FL BY CONSTRUCTION OF SEWER LAGO CITY).
309 So 2d, p 515-516 (Mississippi, 1975), 2 p

Descriptors: *Mississippi, * *Construction, *Overflow, *Sewage lago dicial decisions, Penalties(Legal), disposal, Floods, Flood damage, Legal Water law, Wastes, Domestic wastes, M wastes, Sewers, Lagoons, Sewerage.
Identifiers: *Negligent cons Nuisance(Legal aspects).

Plaintiff sought to recover damages a sequence of the flooding of his lands recently constructed sewer lagoon of th dant city on nearby property. The tri awarded plaintiff damages. The Supreme firmed, finding the defendant had no e license, or consent from appellee to c water or sewage to flow onto or across The Court found, however, that a certai of the damages awarded were not proven ciently clear evidence, and therefore new trial on the issue of damages. In th tive, plaintiff was given the option of ent mittitur for the unproven portion of the before the judgement became final. (Florida)
W76-03953

UNITED STATES V. MAINE (COMPL U.S. AGAINST 13 ATLANTIC STA DETERMINE OWNERSHIP OF BEYOND THREE-MILE MARGINAL S
95 S Ct 1155-1162 (1975), 8 p.

Descriptors: *Judicial decisions, *Atlan Plain, *Federal government, *Submer Act, *Ownership of beds, State gov Boundary disputes, Legal aspects, Legislation, Boundaries(Property), B under water, Continental Shelf, Tid Aquatic soils, Land tenure.

tifiers: Territorial waters, Seabed mining, At-
c states, Seabed ownership, Outer Continen-
helf Lands Act, Coastal waters.

ıtiff, the federal government, filed a complaint
ıst the thirteen Atlantic states to determine
ership of the seabed in the area beyond the
-mile marginal sea. Plaintiff claimed
reign rights over the area for the purpose of
ıiting the natural resources and claimed that
defendant had interferred with those rights.
ndants, with the exception of Florida,
ed title to the seabed to the limits of U.S. ter-
al waters. The Special Master determined
ɔrior case law mandated a finding in favor of
Jnited States. The Supreme Court affirmed,
ıg that the protection and control of marginal
s a function of national sovereignty. The
t rejected defendants' claim to ownership
to adoption of the Constitution. Both the
ıerged Lands Act of 1953 and the Outer Con-
tal Shelf Lands Act of 1953 confirm the
ıount rights of the United States to the
ore seabed. (Jenkins-Florida)
03954

**ED STATES V. DIAMOND (ACTION TO
ɔIN IN CERTAIN SALT WATER TIDAL
SHLANDS).**
2d, p 157-160 (Fifth Circuit Court of Ap-
1975), 6 p.

iptors: *Georgia, Judicial decisions, *High
mark, *Permits, *Rivers and Harbors Act,
able waters, Federal jurisdiction,
ging, *Tidal marshes, *Regulation, Environ-
l effects, Environmental control, Real pro-
Legals aspects, Penalties(Legal), Construc-
Land tenure, Landfills, Land use, Struc-
Boundaries(Property), Harbors.
fiers: Fill permits, Injunctive relief, Naviga-
ɔstruction, Standing(Legal).

ff, federal government, sued to enjoin de-
ıt, landowner, from filling and construction
ions on certain saltwater tidal marshlands
by defendant. Defendant obtained a permit
d a walkway and dock. At that time permits
ɔreward filling were not required if the dock
d the boundary of a designated harbor line.
ıdant argued that the prior permit constituted
acto designation of a harbor line; that the
is not a navigable body of water; that his
ty is above the mean high tide line and thus
the jursidiction of the Corps of Engineers;
at a suit to enforce the Rivers and Harbors
1899 can only be brought at the request of
retary of Army. The Fifth Circuit Court of
is affirmed the lower court injunction hold-
t the dock permit did not extend to filling in
rsh because no formal harbor lines were
shed at that time. Further, the body of water
ng the land was held to be legally navigable.
ıants' claim that his property lay landward
mean high water mark was a factual deter-
ɔn which would not be reviewed on appeal
plain error. (Jenkins-Florida)
955

**RVATION AND DEVELOPMENT OF
'AL AREAS.**
le, Tit 8, S 312-320, (Cum Supp 1973).

ɔtors: *Alabama, *Administrative agencies,
resources development, Permits, Preser-
Resource allocation, Legislation, Riparian
Commercial fishing, Recreation, Indus-
lineral industry, Coasts, Shores, Decision
Leadership, Planning, Water policy,
zoning, Ecology, Estuaries, Harbors,
government, Dredging, Landfills.
ers: *Coastal waters, Coastal Zone
ment Act of 1972, Public hearings, Coastal
ınagement, State policy.

Alabama declares herein that it is state policy to preserve, protect and develop the resources of the state's coastal area. It is, therefore, of prime concern to the state that the various counties and municipalities have unified and standardized methods and policies for dealing with water use. The Alabama coastal area board, composed of eight members who shall be paid for expenses only, is to develop a program to include: (1) identification of coastal area boundaries; (2) identification of coastal resources; (3) evaluation of resources; (4) determination of conflicts in coastal resource use and development; (5) determination of permissible coastal area uses; (6) designation of areas of particular concern in the coastal area; and (7) development of guidelines for permit issuance in compliance with general coastal program aims. The board is empowered to initiate legal action against any person believed to be in violation of this statute. (Parrish-Florida)
W76-03956

STATE OF FLORIDA BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT TRUST FUND V. CHARLEY TOPPINO AND SONS, INC (ACTION FOR WRONGFUL EXCAVATION AGAINST OWNER OF SUBMERGED LANDS IN BAY OF FLORIDA).
514 Federal Reporter 2 d, p 700-704, (Fifth Circuit Court of Appeals, 1975), 5 p.

Descriptors: *Florida, *Excavation, *High water mark, *Dreding, Trespass, Public rights, Water law, Judicial decisions, Harbors, Public lands, Management, Navigable waters, Abatement, Channels, Construction, Federal jurisdiction, Rivers and Harbors Act, Administrative agencies, Permits, Water rights, Boundaries(Property), Ownership of beds, Seashores, Bays.
Identifiers: *Injunctive relief, *Bay of Florida.

Plaintiff Board of Trustees filed suit against contractor defendant alleging wrongful excavation of plaintiff's land lying beneath the navigable waters of the Bay of Florida. In 1965 defendant bought two parcels of submerged lands held in trust by plaintiff and began dredging activities to convert the area into a small harbor. Plaintiff claimed some of the dreding was on its land and sought an injunction to require restoration. The United States District Court for the Southern District of Florida conceded that plaintiff stated a valid cause of action, but denied relief on grounds that plaintiff had failed to prove ownership of the lands in question. Determination of ownership depends on the location of a boundary line which is fixed by the mean high water line. Surveyors testified that the mean high water line in the Bay of Florida may vary by as much as 600 feet at some points. The court ruled that plaintiff had failed in its burden of proof because there was insufficient evidence showing whether defendant's actions, in fact, constituted a trespass. The Fifth Circuit Court of Appeals found no reversible errors and affirmed. (Parrish-Florida)
W76-03957

UNITED STATES V. DETREX CHEMICAL INDUSTRIES, INC. (VIOLATION OF POLLUTION DISCHARGE PERMIT).
393 F Supp, p 735-739, (N D Ohio, E D, 1975), 5 p.

Descriptors: *Penalties(Legal), *Federal Water Pollution Control Act, *Water pollution control, *Federal government, Legals aspects, Water law, Permits, Regulation, Legislation, Judicial decisions, Water quality, Water quality control, Chemical wastes, Industrial wastes, Pollutants, Public health, Water pollution sources, Water pollution effects, Organizations, Wastes.
Identifiers: Federal Water Pollution Control Act (FWPCA) Amendments of 1972, *National Pollutant Discharge Elimination System.

The United States government brought an action against defendant chlorine-alkaline plant to collect civil monetary penalties for exceeding the bounds of a National Pollutant Discharge Elimination System permit and for violation of an order by the Environmental Protection Agency (EPA). Defendant contended that it can be assessed only a maximum penalty of $10,000 per day regardless of the number of violations, and that an EPA order, requiring defendant to comply with the terms of its permit before a specified date, precluded the assessment of civil penalties for violations which occurred before the date. The United States District Court for the Northern District of Ohio held that under the Federal Water Pollution Control Act, the maximum civil penalty for violation of a National Pollutant Discharge Elimination System permit is $10,000 per day regardless of the number of violations occurring on that day. The court also held that the EPA order requiring defendant to comply with the terms of its permit before a specified date did not preclude assessment of civil penalties for violations which occurred before that date. (Nursey-Florida)
W76-03958

LEGAL ASPECTS OF WASTE POLLUTION LAWS,
Kansas Livestock Association, Topeka.
For primary bibliographic entry see Field 5G.
W76-03975

RACEWAYS: EXOTIC SPECIES MOST AFFECTED BY PROPOSED E.P.A. DISCHARGE PERMITS,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 5G.
W76-03980

IMPACTS OF IMPOSING SELECTED POLLUTION CONTROLS,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-03982

STATUS OF THE ILLINOIS LIVESTOCK WASTE MANAGEMENT REGULATIONS,
Illinois State Environmental Protection Agency, Springfield. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5G.
W76-03984

6F. Nonstructural Alternatives

ENVIRONMENTAL MANAGEMENT FOR THE METROPOLITAN AREA-WATER QUALITY, PART III.
Stevens, Thompson and Runyan, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W76-03501

MEASURING OUR WATER SUPPLY,
For primary bibliographic entry see Field 6D.
W76-03597

NEW CLASSIFICATIONS ADOPTED AND ASSIGNED TO CERTAIN WATERS IN THE YADKIN RIVER BASIN.
North Carolina Environmental Management Commission, Raleigh.
For primary bibliographic entry see Field 5G.
W76-03598

ORDINANCE AMENDING THE COMPREHENSIVE ZONING ORDINANCE NO. 3011 (FOR FLOOD HAZARD PROTECTION, FORT WORTH, TEXAS).
Fort Worth, Tex.
Ordinance 6567 (1971). 13 p.

Descriptors: *Flood plains, *Water zoning, *Flood plain zoning, *Land use, *Texas, Flood control, Flood recurrence interval, Penalties(Legal), Administration, Maps, Legislation, Land development, Nonstructural alternatives, Water policy, Water law, Utilities, Public health.
Identifiers: *Administrative procedures, Fort Worth(Tex).

This ordinance divides flood plain districts, based upon the probability of floods within those areas, into two categories: lands subject to floods every one hundred years, and lands subject to floods every fifty years. It then presents a detailed list of land uses permitted within each of the categories. The City of Fort Worth Public Works Department is responsible for delineating these different areas which must be shown on the official map of the city. A procedure is specified whereby exceptions to permitted uses on lands subject to floods every one hundred years may be allowed by the Zoning Board of Adjustment. Persons applying to the Board for such an exception must present detailed information on a number of topics specified in the ordinance. If this information shows that the objectives of the use restrictions will not be injured by the proposed use, the Board may grant the exception. Fines are authorized to aid the appropriate authorities in enforcing all the provisions of this ordinance. (Hoffman-Florida)
W76-03599

FLOOD HAZARDS ALONG THE BALCONES ESCARPMENT IN CENTRAL TEXAS--ALTERNATIVE APPROACHES TO THEIR RECOGNITION, MAPPING, AND MANAGEMENT,
Texas Univ. at Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 4A.
W76-03723

THE RIVER THAMES FLOOD DEFENCE BARRIER,
Great London Council, (England), Dept. of Public Health Engineering.
For primary bibliographic entry see Field 4A.
W76-03800

AMENDMENTS TO ZONING ORDINACE FOR FLOOD CONTROL.
Charleston County, S C Ordinances 178, 183, 184, (1974), 4 p.

Descriptors: *South Carolina, *Water zoning, *Building codes, *Electrical wiring, *Legislation, Plumbing, Flood protection, Valves, Safety factors, Insurance, Protection, Regulation, Standards, Sewers, Zoning, Permits, Structures, Buildings.
Identifiers: *Flood hazard areas.

Ordinance 178 amends the zoning ordinance for Charleston, South Carolina, by requiring that the first floor elevation of new or moved structures must meet the minimum height requirements of flood boundaries set by the Federal Flood Insurance Program. The ordinance also makes technical amendments concerning flood hazard zones in the section relating to zoning permit requirements. The Charleston zoning ordinance had adopted by reference the National Electric Code as the electric code for Charleston County, Ordinance 183 amends that portion of the zoning ordinance by adding regulations concerning electric wiring, circuits, and panels in flood hazard areas. The Charleston zoning ordinance had also adopted by reference the Southern Standard Plumbing Code as the plumbing code for Charleston County, Ordinance 184 amends that portion of the zoning ordinance by requiring the installation of a backwater valve in the house sewer or drain line. (Hoffman-Florida)
W76-03933

FLOOD HAZARD AREAS.
Vermont State Agency of Environmental Conservation, Monpelier.
Vermont, Gen Act No 263 (1974), 5 p.

Descriptors: *Vermont, *Flood control, *Water zoning, *Water management(Applied), *Multipurpose projects, Administration, Management, Regulation, Water policy, Legislation, Standards, Comprehensive planning, Water law, Legal aspects, Jurisdiction, Flood damage, Floods, Hazards.
Identifiers: *Flood management, *Flood hazard areas.

The General Assembly of the State of Vermont has found it necessary to initiate a management program flood-prone lands. To serve as the basis for this program, the Secretary of the Agency of Environmental Conservation shall notify each municipality of the location of flood hazard areas within its jurisdiction. After being so advised the municipality is required to hold a public hearing and to follow other prescribed administrative procedures for informing the public as to the contents of the flood hazard designation. Within a stipulated time after the public hearing, the municipality, after consultation with the regional planning commission, shall make any necessary alterations to the flood hazard area. After the flood hazard area designation becomes final, the municipality will adopt flood hazard bylaws aimed at regulating the area. The Secretary of the Agency will send to the municipalities sample bylaws to help them in formulating their own particular bylaws. These bylaws will set up standards and criteria for uses within the flood hazard areas. Before these bylaws may be adopted, the public is to be provided with certain specified opportunities to comment upon them. (Hoffman-Florida)
W76-03934

GUIDELINES FOR DELINEATION OF FLOODWAYS AND FLOOD HAZARD AREAS.
Indiana State Dept. of Natural Resources, Indianapolis.
Indiana Natural Resources Comm Policy Statement, March 28, 1974, 8 p.

Descriptors: *Indiana, *Regulation, *State governments, *Floodways, *Flood plains, Floods, Flood protection, Flood peak, Flood control, Flood flow, Flood data, Flood profiles, Administrative agencies, Bodies of water, Water, Water law, Legal aspects, Floodwater, Hazards.
Identifiers: *Flood hazard areas.

Indiana has adopted guidelines for the delineation of Natural Resource Commission floodways and flood hazard areas, and shall apply them to the delineation of all such areas in the State of Indiana. Guidelines are set forth whereby the flood protection afforded by existing dams, dikes, levees, and other channel modifications will be recognized in determining the adequancy of flood protection. Also set forth are procedures for the determination of provisional peak regulatory flood discharge and final peak regulatory flood discharge. The regulatory flood profile shall be determined by successive solutions of the dynamic equation of gradually varied flood based on the Bernoulli Energy Equation, using electronic computer programs and the procedures set forth in this policy. Provisions are included covering the methods to be used in the delineation of floodways, flood hazard areas, floodway districts, and floodway fringe districts. All such delineations are subject to approval by the Natural Resources Commission, With respect to bodies of water which constitute interstate borders, determinations and delineations made pursuant to this policy will be accomplished in coordination with the party state or states. (Schilling-Florida)
W76-03935

MODEL ZONING ORDINANCE FOR FLO HAZARD AREAS.
Indiana Dept. of Natural Resources, Indianapo
Indiana Department of Natural Resources, M
Ordinance (1974), 8 p.

Descriptors: *Permits, *Indiana, *Local gov ments, *Classification, *Flood plain zon Governments, Administrative agencies, Leg tion, Water law, Legal aspects, Floods, Flood tection, Flood control, Flood flow, Flood pl Flood profiles, Flood proofing, Flood wa Floodways, Water utilization.

This model ordinance recommends that flood areas be divided into two sections: Flooc (FW) districts and Floodway Fringe (FF) dist The floodway is defined as the area which ca the principal flow of floodwaters. The flooc fringe, which is subject to fewer restrictio that area likely to be covered by quiescent f waters. In FW districts, it is recommended only agricultural, recreationa, park and for uses, and wildlife and nature areas be permitt right. The following uses would be special e tions in such areas, and allowed only after a p has been obtained: water management faci transportation facilities; water-related urban ties; temporary or seasonal uses; and other tolerant or open space urban uses. With resp FF districts, any use deemed appropriate wo allowed, the sole restriction being that all bui constructed have a flood protection grade a two feet above the regulatory flood profile. flood plain is not divided into FW and FF dis the provisions set forth for FW districts apply to the entire flood plain. (Schilling-Flo
W76-03936

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL MANAGEMENT FO METROPOLITAN AREA-WATER QUA PART III.
Stevens, Thompson and Runyan, Inc., Wash.
For primary bibliographic entry see Field 5C
W76-03501

A NEW APPROACH TO INTERNATION VIRONMENTAL COOPERATION; THE COMMITTEE ON THE CHALLENGE MODERN SOCIETY,
Environmental Protection Agency, Wash D. C.
For primary bibliographic entry see Field 5
W76-03594

FEDERAL ENVIRONMENTAL LAWS REGULATIONS,
Fluor Engineers and Constructors, Inc., A Calif.
For primary bibliographic entry see Field 5
W76-03806

RESEARCH NEEDS RELEVANT TO EN MENTAL DATA, (PAPER OF THE TEC COUNCIL ON WATER RES PLANNING AND MANAGEMENT),
Environmental Research and Technolo Concord, Mass. Environmental Studies D B. H. Willis.
Journal of the Hydraulics Division, Proce ASCE, Vol 101, No HY11, p November, 1975. 4 fig, 1 ref, 1 app.

Descriptors: *Environmental control, * lections, *Research priorities, Environm fects.
Identifiers: *Environmental data, * needs, Data requirements, Environmen statement.

lems associated with the adequacy of en-
mental data, primarily as currently incor-
ed in environmental impact assessment re-
, are analyzed. The context in which environ-
al data are used must be considered. Data can
ed for academic and scientific research pur-
, environmental impact assessment pur-
, or resource planning purposes. In all three
the data requirements are different. Often,
ver, the distinctions are not made. Two basic
acquisition requirements are necessary: the
ishment of an initial preproject data base;
he monitoring of actual impacts during the
tion of the project. Data requirements neces-
o establish intermedia relationships must be
ished. The development and application of
echniques for collecting environmental data
so necessary. Remote sensing techniques can
plied, especially after the recent develop-
in military reconnaissance and the space
m. Regional data monitoring networks
l also be implemented. Major elements of
systems are now in operation. Perhaps the
ritical research need is to coordinate current
ollection efforts to make data readily ac-
le to users. Data collection activities should
ordinated. There should be an efficient
for updating environmental data. Data ap-
ate to indicate cumulative environmental im-
of projects on a regional scale should be
ied. This brings up the question of level of
for the analysis of site-specific impacts. It is
ded that, due to a lack of a coordinated en-
ental data base, environmental impact
ent efforts are inefficient. (Pinto-FIRL)
3823

NESQUE LAKE, COWANESQUE RIVER,
COUNTY, PENNSYLVANIA, (FINAL
ONMENTAL IMPACT STATEMENT).
of Engineers, Baltimore, Md.
mary bibliographic entry see Field 8A.
923

SUBMARINE BASE, NEW LONDON,
ON, CONNECTICUT DREDGE RIVER
NEL, VOLUME 1, (ENVIRONMENTAL
T STATEMENT).
ment of the Navy, Washington, D.C.
nary bibliographic entry see Field 8A.
924

IERMAL LEASING PROGRAM, VOLS.
D III--LEASING OF GEOTHERMAL
RCES IN THREE CALIFORNIA AREAS
ENVIRONMENTAL IMPACT STATE-
.
ment of the Interior, Washington, D.C.
nary bibliographic entry see Field 4B.
925

REW SANCTUARY: USE OF THE MAR-
R PRESERVATION,
mental Protection Agency, Boston, Mass.
ary bibliographic entry see Field 6G.
928

REW SANCTUARY: USE OF THE MAR-
R PRESERVATION,
mental Protection Agency, Boston, Mass.
e.
mental Affairs, Vol 3, No 4, p 647-686
) p, 53 ref.

ors: *Wildlife habitats, *Preservation,
s, *Florida, Drainage, Drainage area,
Dikes, Local governments, Marsh
ment, Runoff, Droughts, Surface-ground-
lationships, Wildlife management, Water
ents, Water level fluctuations, Marshes,
vernments, Costs, Ecosystems, Cranes,
alue, Public benefits.

Identifiers: *National Audubon Society, *Corkscrew Swamp Sanctuary, Refuges, Water table, Cypress, Storks.

The National Audubon Society, owner and manager of Corkscrew Swamp Sanctuary in Collier County, Florida, is currently involved in a conflict with a real estate developer to preserve the swamp from suffering the effects of drainage on the developer's adjacent lands. By marshalling the funds and votes of local, environmentally concerned residents, the Society has been able to force the developer to modify his operations, as well as to buy a significant amount of 'buffer' acreage. Still, the drainage goes on, lowering the water table of the whole area and threatening the swamp's continued viability as a wildlife refuge and cypress stand. The Society's greatest problem is proving, in dollar terms, the worth of the swamp, and therefore the degree of damages caused by drainage. Since any area that is open for the use and enjoyment of the public benefits both paying and non-paying supporters, the amount that the Society has been able to solicit for swamp preservation is not an adequate description of its value. Furthermore, mere preservation is not enough, in many cases, since success depends on the integration of the subecosystem of the natural area into a larger inclusive system under regional control. (Parrish-Florida)
W76-03928

EASTLAKE COMMUNITY COUNCIL V. ROANOKE ASSOCIATES, INC. (ENVIRONMENTAL CHALLENGE TO CONSTRUCTION ON LAKESHORE).
For primary bibliographic entry see Field 6E.
W76-03937

7. RESOURCES DATA

7A. Network Design

RESEARCH NEEDS RELEVANT TO ENVIRONMENTAL DATA, (PAPER OF THE TECHNICAL COUNCIL ON WATER RESOURCES PLANNING AND MANAGEMENT),
Environmental Research and Technology, Inc., Concord, Mass. Environmental Studies Div.
For primary bibliographic entry see Field 6G.
W76-03823

STREAM CHANNEL MEASUREMENTS IN NEW ZEALAND,
Victoria Univ., Wellington (New Zealand). Dept. of Geography.
R. J. Eyles.
Journal of Hydrology (New Zealand), Vol 13, No 2, p 135-138, 1974. 1 fig, 1 tab, 10 ref.

Descriptors: *Streams, *Geomorphology, *Drainage density, Erosion, Channel morphology, Channels, Measurement.
Identifiers: *Fluvial process, *New Zealand, Definitions, Stream length, Mesh length.

The confusion arising from using morphometric data published by various agencies without following any consistent definition was described. As an example, it was pointed out that stream lengths as defined by the New Zealand Ministry of Works constitute the length of the stream up to the boundary divide line, also called 'mesh lengths.' However, in standard and normal definition, the stream length for each order of stream is defined as the length of the active channel. Some examples of misinterpretation were cited. Finally it was concluded that the morphometric data published by the New Zealand Ministry of Works are misleading because of the error of confusing mesh length with stream channel length. (Bhowmik-ISWS)
W76-03856

7B. Data Acquisition

APPLICATION OF PULSE POLAROGRAPHY TO POLLUTANT ANALYSIS,
Princeton Applied Research Corp., Princeton, N.J.
For primary bibliographic entry see Field 5A.
W76-03529

THE SQUARE-WAVE POLAROGRAPH AND ITS APPLICATION TO THE DETERMINATION OF HEAVY METALS IN THE ENVIRONMENT,
Iowa Univ., Iowa City. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-03530

GULF GENERAL ATOMIC PHENOL MONITOR,
Gulf General Atomic, Inc., San Diego, Calif.
For primary bibliographic entry see Field 5A.
W76-03531

AUTOMATIC SEWER SAMPLING SYSTEM MONITORS FOR SPILLS,
Union Carbide Corp., Chicago, Ill.
For primary bibliographic entry see Field 5A.
W76-03696

PERFORMANCE OF AUTOMATIC WASTEWATER COMPOSITIONS,
Environmental Protection Agency, Region VII, Kansas City, Missouri.
For primary bibliographic entry see Field 5A.
W76-03698

OXYGEN DEMAND PARAMETERS: CORRELATION OF BOD5 WITH COD,
Sangamon State Univ., Springfield, Ill.
For primary bibliographic entry see Field 5A.
W76-03701

USE OF SATELLITE DATA IN URBAN HYDROLOGIC MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, and T. J. Jackson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY12, Proceedings Paper 11790, p 1469-1475, December 1975. 2 fig, 2 tab, 5 ref, 1 append. NASA NSG 5017.

Descriptors: *Aerial photography, *Remote sensing, *Land use, *Maryland, *Watersheds(Basins), Hydrology, Urbanization, Hydraulics, Satellites(Artificial), Computers, Model studies.
Identifiers: *LANDSAT, *Multispectral scanner subsystem, *Anacostia River Basin(Md).

The study investigated the use of computer-aided analysis of LANDSAT multispectral data in estimating percentage of imperviousness and associated land uses needed in urban hydrologic modeling. An interactive computer was used to delineate seven land use classifications in the 132-sq mi Maryland portion of the Anacostia River Basin from LANDSAT data. The land-use distributions compared favorably with those of an earlier study which obtained the same information through analysis of aerial photographs having a scale of 1:4800. The LANDSAT data was used to estimate the basin imperviousness as 25.1%, while the aerial photographic study had given 23.5%. Comparisons between the photographic and LANDSAT imperviousness estimates were made for subareas within the Anacostia Basin as small as 0.14 sq mi. Approximately 94 man-days were required to complete the land-use analysis using the aerial photographs while less than 4 man-days were required to accomplish similar tasks using the LANDSAT data. (Lardner-ISWS)
W76-03748

RESPONSE TESTING OF PIEZOMETERS IN FRACTURED POROUS MEDIA,
Alberta Univ., Edmonton. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W76-03751

NEW TOOL ACCELERATES DIRECTIONAL SURVEYING.
World Oil, Vol 181, No 5, p 91-95, October 1975, 3 fig.

Descriptors: *Boreholes, Telemetry, *Data transmission, Drilling fluid, Pressure measuring instruments.
Identifiers: Borehold azimuth, Borehold inclination.

A borehole telemetry system currently being field tested reduces the time required to obtain directional surveys or orient directional tools. The downhole equipment consists of a sensor and transmitter mounted in a nonmagnetic drill collar and protected from vibration by isolators in the top and bottom of the collar. The system transmits data through the drilling fluid in the form of pressure pulses whenever rotation is halted. The data are received by the surface equipment which consists of a printout console that contains a printer to provide a permanent record for each reading, and a display console which provides a lighted display of the data. Downhole equipment remains in the drill string and is always ready for use. Advantages that may result from the new system include reduced survey time, reduced tool orienting time, less risk of sticking bottomhole assemblies during surveys and existing drilling equipment requires no modification. (Ukayli-NWWA)
W76-03758

A COMPARATIVE EVALUATION OF THE WEISS SATUROMETER,
Battelle Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5A.
W76-03774

SOLAR HEATING TO PREVENT FREEZING IN RECORDING RAINGAUGES,
Lincoln Coll. (New Zealand). Tussock Grasslands and Mountain Lands Inst.
For primary bibliographic entry see Field 2B.
W76-03857

SUSPENDED SOLIDS IN WATER.
Office of Naval Research, Arlington, Va. Ocean Science and Technology Div.
For primary bibliographic entry see Field 2L.
W76-03876

PRINCIPLES OF STUDYING SUSPENDED MATERIALS IN WATER,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W76-03877

BEAM TRANSMISSOMETERS FOR OCEANOGRAPHIC MEASUREMENTS,
Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
For primary bibliographic entry see Field 2L.
W76-03879

VOLUME-SCATTERING FUNCTIONS IN OCEAN WATERS,
Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
For primary bibliographic entry see Field 2L.
W76-03880

ABSOLUTE CALIBRATION OF A SCATTERANCE METER,
Texas A and M Univ., College Station. Dept. of Physics.
For primary bibliographic entry see Field 2L.
W76-03883

THE SUSPENDED MATERIAL OF THE AMAZON SHELF AND TROPICAL ATLANTIC OCEAN,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W76-03889

APPLICATIONS OF ERTS IMAGERY TO SNOW AND GLACIER HYDROLOGY,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2C.
W76-03902

METHODS FOR COLLECTION AND ANALYSIS OF AQUATIC BIOLOGICAL AND MICROBIOLOGICAL SAMPLES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-03915

7C. Evaluation, Processing and Publication

MEASURING OUR WATER SUPPLY,
For primary bibliographic entry see Field 6D.
W76-03597

TIDAL DATUMS AND MAPPING TIDAL BOUNDARIES,
National Ocean Survey, Rockville, Md.
For primary bibliographic entry see Field 6E.
W76-03625

FIELD STUDY OF EVAPORATION--CATALOGUE OF DATA FOR PHASE I,
Bureau of Meteorology, Melbourne (Australia). Dept. of Science.
For primary bibliographic entry see Field 2D.
W76-03724

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W76-03725

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W76-03726

CONTROLLING WELL KICKS WHEN SHUT-IN METHODS ARE UNSAFE,
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8C.
W76-03760

PROCESS CONTROL AS AN AID TO POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W76-03795

MULTI-PROCESS BIOLOGICAL TREATMENT MODEL,
CH2M Hill, Bellevue, Wash.
For primary bibliographic entry see Field 5D.
W76-03799

RESEARCH NEEDS RELEVANT TO ENVIRO MENTAL DATA, (PAPER OF THE TECHNIC COUNCIL ON WATER RESOURC PLANNING AND MANAGEMENT),
Environmental Research and Technology, I Concord, Mass. Environmental Studies Div.
For primary bibliographic entry see Field 6G.
W76-03823

APPENDIX 2, SURFACE WATER HYDRO GY, GREAT LAKES BASIN FRAMEWO STUDY.
Great Lakes Basin Commission, Ann Ar Michigan, Public Information Office.
For primary bibliographic entry see Field 2E.
W76-03862

APPENDIX 3, GEOLOGY AND GRO WATER, GREAT LAKES BASIN FRAMEW STUDY.
Great Lakes Basin Commission, Ann Ar Michigan , Public Information Office.
For primary bibliographic entry see Field 2F.
W76-03863

APPENDIX 7, WATER QUALITY, GR LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann A Michigan, Public Information Office.
For primary bibliographic entry see Field 5A.
W76-03864

APPENDIX 11, LEVELS AND FLOWS, G LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann A Michigan, Public Information Office.
For primary bibliographic entry see Field 4A.
W76-03865

APPENDIX 12, SHORE USE AND ERO GREAT LAKES BASIN FRAMEWORK ST
Great Lakes Basin Commission, Ann A Michigan, Public Information Office.
For primary bibliographic entry see Field 2L
W76-03866

APPENDIX 14, FLOOD PLAINS, G LAKES BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Michigan, Public Information Office.
For primary bibliographic entry see Field 4A
W76-03867

APPENDIX 15, IRRIGATION, GREAT BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Michigan, Public Information Office.
For primary bibliographic entry see Field 3
W76-03868

APPENDIX 16, DRAINAGE, GREAT BASIN FRAMEWORK STUDY.
Great Lakes Basin Commission, Ann Michigan, Public Information Office.
For primary bibliographic entry see Field 4
W76-03869

APPENDIX 18, EROSION AND SEDI TION, GREAT LAKES BASIN FRAM STUDY.
Great Lakes Basin Commission, Ann Michigan, Public Information Office.
For primary bibliographic entry see Field
W76-03870

SUSPENDED SOLIDS IN WATER.
Office of Naval Research, Arlington, V Science and Technology Div.
For primary bibliographic entry see Field

03876

THEORY MODELS OF LIGHT SCATTER-
BY OCEAN PARTICULATES,
i Univ., Coral Gables, Fla. Dept. of Physics.
rimary bibliographic entry see Field 2L.
03881

IAL DISTRIBUTION OF THE INDEX OF
RACTION OF SUSPENDED MATTER IN
OCEAN,
n State Univ., Corvallis. School of Oceanog-
.
rimary bibliographic entry see Field 2L.
03882

CTS OF TROPICAL STORM AGNES ON
SUSPENDED SOLIDS OF THE
THERN CHESAPEAKE BAY,
Hopkins Univ., Baltimore, Md. Chesapeake
ist.
imary bibliographic entry see Field 2L.
03884

TINUOUS LIGHT-SCATTERING
ILES AND SUSPENDED MATTER OVER
AT DEEP-SEA FAN,
ngton Univ., Seattle. Dept. of Oceanogrphy.
imary bibliographic entry see Field 2L.
3886

ICAL, CHEMICAL, AND OPTICAL MEA-
S OF SUSPENDED-PARTICLE CONCEN-
IONS: THEIR INTERCOMPARISONS
APPLICATION TO THE WEST AFRICAN
F,
rsity of South Florida, St. Petersburg. Dept.
ine Science.
mary bibliographic entry see Field 2L.
3887

DISTRIBUTION OF PARTICULATE
ER IN A NORTHWEST AFRICAN
TAL UPWELLING AREA,
nagen Univ., Denmark. Inst. of Physical
ography.
mary bibliographic entry see Field 2L.
3888

DITY DISTRIBUTION IN THE DEEP
RS OF THE WESTERN ATLANTIC
GH,
t-Doherty Geological Observatory,
es, N.Y.
mary bibliographic entry see Field 2L.
590

TIONS IN BENTHIC BOUNDARY
PHENOMENA: NEPHELOID LAYER IN
ORTH AMERICAN BASIN,
t-Doherty Geological Observatory,
es, N.Y.
mary bibliographic entry see Field 2L.
891

BUTION OF SUSPENDED PARTICLES
EQUATORIAL PACIFIC OCEAN,
State Univ., Corvallis. School of Oceanog-
nary bibliographic entry see Field 2L.
892

NDED MATTER AND THE STABILITY
E WATER COLUMN: CENTRAL CARIB-
EA,
A and M Univ., College Station. Dept. of
graphy.
nary bibliographic entry see Field 2L.
893

LIGHT-SCATTERING MEASUREMENTS AND CHEMICAL ANALYSIS OF SUSPENDED MATTER IN THE NEAR-BOTTOM NEPHELOID LAYER OF THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-03894

LIGHT SCATTERING AND SUSPENDED PARTICULATE MATTER ON A TRANSECT OF THE ATLANTIC OCEAN AT 11 DEG N,
University of South Florida, St. Petersburg. Dept. of Marine Science.
For primary bibliographic entry see Field 2L.
W76-03895

STATISTICAL SUMMARIES OF STREAMFLOW RECORDS, OKLAHOMA, THROUGH 1974,
Geological Survey, Oklahoma City, Okla.
L. D. Mize.
Open-file report, October 1975. 399 p, 6 fig, 3 tab, 3 ref.

Descriptors: *Streamflow, *Basic data collections, *Flow measurement, *Gaging stations, *Oklahoma, Average flow, Low flow, High flow, Flow characteristics, Natural flow, Regulated flow.

Tables summarizing daily streamflow data by year are presented for gaging stations in Oklahoma that have at least 5 years to either unregulated or regulated stream-gaging record through September 30, 1974. Separate tables are presented for unregulated and regulated periods of record. These summary tables include: (1) the number of days in each year that the daily discharge was between selected limits (duration tables), (2) the lowest mean daily discharge (frequency tables), (3) the highest mean daily discharge (frequency tables), (4) a monthly duration table for each station with 29 years or more of essentially unregulated record, and (5) statistics of annual discharge. These summaries provide useful information about the quantity, distribution, and variability of streamflow and provide basic data for developing relations for estimating streamflow at sites other than regular stream-gaging sites. (Woodard-USGS)
W76-03904

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1975.
Geological Survey, Baton Rouge, La.
Water-Data Report LA-75-1, 1975. 816 p, 5 fig, 3 tab, 31 ref.

Descriptors: *Hydrologic data, *Surface water, *Groundwater, *Water quality, *Louisiana, Basic data collections, Streamflow, Gaging stations, Flow rates, Lakes, Reservoirs, Well data, Water levels, Chemical analysis, Physical properties, Sediments, Water temperature, Water analysis.

Water resources data for the 1975 water year for Louisiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality for wells. This report contains discharge records for 76 gaging stations; stage only records for 36 gaging stations; water quality for 79 continuous, daily or bi-weekly stations, 20 partial-record stations, and 6 wells; and water levels for 105 observation wells. Also included are data for 84 crest-stage partial-record stations and 114 flood-profile partial-record stations. Additional water data were collected at 433 various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Louisiana. (Woodard-USGS)
W76-03907

HYDROLOGIC UNIT MAP--1974, STATE OF ARIZONA.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va, 22092, Price $1.25.
Hydrologic Unit Map, 1975. 1 sheet, 1 map.

Descriptors: *Maps, Hydrology, *Arizona, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Ariz), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Arizona that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-03909

HYDROLOGIC UNIT MAP--1974, STATE OF CALIFORNIA.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va, 22092, Price $3.00 per set. Hydrologic Unit Map, 1975. 2 sheet, 2 map, 2 tab.

Descriptors: *Maps, Hydrology, *California, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Calif), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

Two maps and accompanying tables show Hydrologic Units in California that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions, and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-03910

THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1974,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 4B.
W76-03911

HARFORD COUNTY GROUND-WATER INFORMATION: WELL RECORDS, CHEMICAL QUALITY DATA, AND PUMPAGE,
Geological Survey, Parkville, Md.
L. J. Nutter, and M. J. Smigaj.
Maryland Geological Survey, Baltimore, Water Resources Basic Data Report No 7, 1975. 89 p, 1 plate, 3 tab, 6 ref.

Descriptors: *Basic data collections, *Water wells, *Well data, *Water quality, *Maryland, Hydrologic data, Groundwater, Chemical analy-

sis, Aquifers, Water levels, Water yield, Specific capacity, Water utilization.
Identifiers: *Harford County(Md).

Well data are presented for about 1,260 wells and chemical analyses for about 135 groundwater samples from Harford County in northwestern Maryland. In addition, pumpage data of major groundwater users are included. About three quarters of the well records and chemical analyses are from wells penetrating metamorphic-rock aquifers; the remaining well records and chemical analyses are from wells penetrating sand and gravel aquifers. (Woodard-USGS)
W76-03912

DRAINAGE AREAS FOR ILLINOIS STREAMS,
Geological Survey, Champaign, Ill.
K. M. Ogata.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-246 298, $5.50 in paper copy, $2.25 in microfiche. Water-Resources Investigation 13-75, 1975. 120 p, 2 fig.

Descriptors: *Drainage area, *Streams, *Illinois, *Basic data collections, River basins, Watersheds(Basins), Sites.
Identifiers: *Drainage areas over 100 sq mi(Ill), Counties, Quadrangles.

Drainage areas are tabulated for all streams in Illinois that drain over 100 sq mi. Also listed are drainage areas for numerous intermediate sites where streamflow data have been collected and for other selected points. The report provides uniform, accurately determined drainage area figures for use in hydrologic investigations--such as low-flow frequency, flood frequency, and rainfall-runoff studies. Usually, drainage area is one of the more important parameters required for planning and design of water-related projects. Two maps of the State of Illinois are shown. One is a map of the counties to aid in the differentiation of streams with identical names (for example, one Vermilion River flows northwest to the Illinois River basin, another Vermilion River flows southeast to the Wabash River basin; both have headwaters in Ford County). The other map superimposes the major Illinois stream systems over the county outlines. (Woodard-USGS)
W76-03913

WATER QUALITY IN RHODE RIVER AT SMITHSONIAN INSTITUTION PIER NEAR ANNAPOLIS, MARYLAND, APRIL 1970 THROUGH DECEMBER 1973,
Geological Survey, Edgewater, Md. Chesapeake Bay Center.
For primary bibliographic entry see Field 5A.
W76-03914

8. ENGINEERING WORKS

8A. Structures

NEW TOOL ACCELERATES DIRECTIONAL SURVEYING.
For primary bibliographic entry see Field 7B.
W76-03758

ADEQUATE FORMATION TESTING CAN REDUCE COMPLETION COSTS,
Halliburton Services, Duncan, Okla.
For primary bibliographic entry see Field 8G.
W76-03759

JOHN DAY DAM, COLUMBIA RIVER, OREGON AND WASHINGTON; HYDRAULIC MODEL INVESTIGATIONS,
Army Engineer Div. North Pacific, Bonneville, Oreg. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-03872

ICE HARBOR DAM, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-03873

LOWER MONUMENTAL DAM, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-03874

COWANESQUE LAKE, COWANESQUE RIVER, TIOGA COUNTY, PENNSYLVANIA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Baltimore, Md.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-PA-73-0345-F; ELR 0345; FLD/GP 13B. October 31, 1972, 128 p, 13 map, 10 photo, 13 tab.

Descriptors: *Pennsylvania, *Reservoir construction, *Recreation facilities, *Flood control, Landfills, Watershed, Basins, Flood plain insurance, Environmental effects, Marinas, Economics, Terrestrial habitats, Aquatic habitats, Wildlife habitats.
Identifiers: Cowanesque lake, Reservoir projects, Relocation of people, Recreational pool, Flood plain management.

A recommendation to allow construction of a reservoir project was given in this final environmental statement on the Cowanesque Lake. The reservoir project will involve the construction of an earth fill dam, dikes, service bridges, housing facilities, access roads, marina facilities, and recreational areas. An analysis was provided comparing the environmental setting without the project with the anticipated environmental setting with the project. Some of the adverse effects expected include the inundation of 410 acres of land by the recreational pool which will eliminate the habitat for all associated terrestrial biota and certain stream dwelling aquatic biota, the relocation of 600 persons, and occasional inundation of 3690 acres by the flood pool. Alternative proposals to the reservoir which were considered included watershed treatments, flood insurance, flood plain management, flood proofing, and a dam with dry lake. These adverse effects and alternative proposals were outweighed, however, by the flood control, recreational are development, and economic enhancements which the proposed plan is expected to produce. (Hoffman-Florida)
W76-03923

NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT DREDGE RIVER CHANNEL, VOLUME 1, (ENVIRONMENTAL IMPACT STATEMENT).
Department of the Navy, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as EIS-CT-74-0077-F-1 (Jan 1974). 74-0077-F-1 (January 1974). 318 p, 41 fig, 17 tab, 2 append.

Descriptors: *Environmental effects, *Connecticut, *Dredging, *Submarines, *Channel improvemen p Navigable rivers, Miliatry aspects, Underwater, Ships, Transportation, Military reservations, Federal government, Aesthetics, Spoil banks, Sounds, Water pollution sources, Water pollution, Water pollution effects, Benthos.
Identifiers: *Environmental Impact Statement, Hazardous substances(Pollution), Offshore spoil disposal.

The project involves deepening and widenin navigation channel from the U.S. Naval S marine Base, New London, Connecticut, to L Island Sound, and offshore dumping of dred spoil. Presently, the area possesses no aestheti historic resources, and is affected by the prese of numerous piers and substantial shipping ac ty. Adverse environmental effects such as creases in water turbidity, decreases in w quality, offensive gases, and destruction of fa and epifaunal biota will occur during dredging dumping operations. However, long-term eff to the marine ecosystem will be minimized. A natives considered were: (1) no project, (2) ferent utilization of the river area, and (3) alter dredging and disposal methods. The prop dredging is consistent with existing Naval operations, will accomodate larger submar and will increase navigability in the channel. I dition to the cost of construction and maintena irreversible commitments of resources inv removal of dredged spoil including all biolo resources in the spoil, as well as disruption pollution of the ecosystem at the dumpsite. mentators were concerned about pollution ca by the dumping of dredged spoil. (Ferna Florida)
W76-03924

GEOTHERMAL LEASING PROGRAM, V II AND III--LEASING OF GEOTHER RESOURCES IN THREE CALIFORNIA A (FINAL ENVIRONMENTAL IMPACT ST MENT).
Department of the Interior, Washington, D.C
For primary bibliographic entry see Field 4B.
W76-03925

8B. Hydraulics

UNIQUE DESIGN IDEAS MAY INCREAS LIFE.
For primary bibliographic entry see Field 8C
W76-03523

NEW LOG DATA GIVE BETTER NORTH WELL COMPLETIONS,
Conoco North Sea, Inc., London (England).
For primary bibliographic entry see Field 4E
W76-03524

FILTER-PACK INSTALLATION REDEVELOPMENT TECHNIQUES FOR LOW RECHARGE SHAFTS,
Agricultural Research Service, Fresno, Water Management Research.
For primary bibliographic entry see Field 4I
W76-03527

MEASURING WATER VELOCITY B TRASONIC FLOWMETER,
Bureau of Reclamation, Denver, Colo. Hy Branch.
J. C. Schuster.
Journal of the Hydraulics Division. A Society of Civil Engineers, Vol 101, No Proceedings Paper 11806, p 1503-1517, D 1975. 11 fig, 4 tab, 4 ref, 1 append.

Descriptors: *Ultrasonics, *Closed conde *Velocity, *Venturi meters, *Flow measu *Electronic equipment, *Open channe Discharge measurement, Hydraulics, P Calibrations, Testing, Laboratory tests.
Identifiers: Transducers, Test results, Int Quadrature methods, Errors.

A limited study of a sing-around ultraso meter was made in a 2.5-ft square laborato nel. Traversing the flow vertically with t transducers produced a satisfactory profile. Integration of the profile by

ds showed a deviation of -3.4% compared to
lk flow velocity Q/A measured by a venturi
in a symmetrical profile for flows ranging
3 cfs-11.4 cfs. Deviations of +14% to -6%
found in an unsymmetrical flow caused by a
ertical plate having a width 10% of the chan-
idth. General operation of the meter was
ctory, and the sing-around principle ap-
satisfactory for discharge measurement.
ner-ISWS)
3749

ORMANCE OF PENNSYLVANIA
WAY DRAINAGE INLETS,
Univ., Bethlehem. Dept. of Civil Engineer-

Brune, W. H. Graf, E. Appel, and P. P. Yee.
l of the Hydraulics Division, American
y of Civil Engineers, Vol 101, No HY12,
dings Paper 11801, p 1519-1536, December
5 fig, 5 tab, 9 ref, 2 append.

ptors: *Drainage, *Intakes structures,
aulics, *Hydraulic similitude,
ylvania, *Highways, Paving, Runoff,
, Grading, Discharge(Water), Testing, Per-
ce, Efficiencies, Laboratory tests, Drains.
iers: Grating, Similarities.

draulic performance of six gratings for the
e inlets used by the Pennsylvania Depart-
f Transportation were tested hydraulically
scale ratio for the model: prototype of 1:2.
principles of similitude were applied to cor-
nodel and prototype behavior. The varia-
the tests were the discharge rate, and the
lopes of swale, side, and longitudinal or
n order to determine the hydraulic efficien-
different rates of approach flow. The tests
that the efficiency of a grating decreases
increase in grade; the efficienty is a max-
with both side slopes being equal. The
rical configuration of the grating did not af-
efficiency of a grating. Ponding of a grat-
ne bottom of a vertical curve occurred only
extremely high rates of flow. Installing a
wnstream from an inlet in a median in-
the capacity markedly. (Lardner-ISWS)
750

MLINING HEAD-LOSS CALCULA-

Associates, Reading, Pa.
arson, Jr.
al Engineering, Vol 82, No 23, p 115-118,
27, 1975. 3 fig, 4 tab.

tors: *Pipes, *Piping
(Mechanical), *Head loss, *Pipeflow, Pipe
eynolds number, Flow, Fluid mechanics,
tes, Temperature.

dure is presented that can simplify the
nation of head-loss of flowing fluids over a
pipe sizes and temperatures. The method
s calculation and graphical construction to
the evaluation of fvv/2g and vv/2g. The
requires a minimum of detailed calcula-
d is very useful for performing parametric
s studies in liquid systems consisting of
nore pipe sizes and having varying liquid
tures in different branches. An example is
illustrate the method with step-by-step in-
s. (Orr-FIRL)
312

ZE AND SHAPE OF SMALL-SCALE
NT RIPPLES: AN EXPERIMENTAL
USING MEDIUM SAND,
niv. (England). Dept. of Geology.
ary bibliographic entry see Field 2J.
54

LOCAL EROSION CAUSED BY RAPID FORCED INFILTRATION,
Aberdeen Univ. (Scotland). Dept. of Engineering.
For primary bibliographic entry see Field 2J.
W76-03858

SEDIMENT MOVEMENT AND FRICTION IN ALLUVIAL STREAMS,
Nigeria Univ., East Central State. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W76-03859

JOHN DAY DAM, COLUMBIA RIVER, OREGON AND WASHINGTON; HYDRAULIC MODEL INVESTIGATIONS,
Army Engineer Div. North Pacific, Bonneville, Oreg. Hydraulic Lab.
R. L. Johnson, and L. Z. Perkins.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-000 326. Price $7.75 in paper copy, $2.25 in microfiche. Technical Report No. 90-1, June 1972. 221 p, 169 fig, 15 tab, 2 ref.

Descriptors: *Model studies, *Hydraulic structures, *Dams, *Columbia River, Spillways, Powerplants, Hydroelectric plants, Diversion structures, Diversion dams, Cofferdams, Reservoirs, Fish ladders, Reservoir operation, Flow, Flow measurement, Hydraulics, Hydraulic design, Structures, Civil engineering.
Identifiers: *John Day Dam(Wash and Ore).

The John Day Project includes a 20-bay spillway, a 20-unit powerhouse (ultimate installation), a single-lift navigation lock 86 ft wide by 675 ft long with a maximum lift of 113 ft, and a 24-ft-wide fish ladder on each bank of the river. Average head on the structures is about 105 ft. Excavation requirements, diversion plans, structures locations, and methods of project operation were studied in a 1:80-scale model that reproduced 2.9 miles of river channel and pertinent overbank topography. A 1:25-scale model was used to determine maximum limits for completion of skeleton powerhouse units through which the river would be diverted during third-stage construction. Improved designs were developed for the first- and second-step cofferdams, navigation lock approaches, temporary and permanent fishway entrances, auxiliary water intake for the Oregon shore fishway, powerhouse tailrace, skeleton units, and disposal fills. Limits for an interim cofferdam on the Oregon shore were evaluated; and satisfactory methods for operation of the completed spillway and fishway entrances were determined. (Sims-ISWS)
W76-03872

ICE HARBOR DAM, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Hydraulic Lab.
L. Z. Perkins.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-000 308. Price $6.00 in paper copy, $2.25 in microfiche. Technical Report No. 22-1, November 1973. 138 p, 99 fig, 11 tab, 3 ref, 1 append.

Descriptors: *Model studies, *Hydraulic models, *Dams, *Hydraulic structures, Spillways, Powerplants, Hydroelectric plants, Diversion structures, Diversion dams, Cofferdams, Fish ladders, Locks, Navigation, Flow, Flow measurement, Hydraulics, Hydraulic design, Structures, Civil engineering.
Identifiers: *Ice Harbor Dam(Wash), *Snake River.

Flow conditions to be expected during and after construction of Ice Harbor Dam were determined in a 1:100-scale hydraulic model that reproduced 2.7 miles of riverbed, pertinent overbank areas, successive structures, excavated channels, and disposal sites. The purposes of the model study were to check the adequacy of originial designs for the project and to develop revisions if required to benefit fish passage, river navigation, energy dissipation, and power generation. Improved designs for the first- and second-stage cofferdams, fishway entrances, powerhouse tailrace, and navigation lock outlet were developed in the model. Diversion of a major portion of the river discharge through three powerhouse skeleton units would facilitate the upstream passage of fish during second-step construction. Alternative methods for operation of the completed project were evaluated. (Sims-ISWS)
W76-03873

LOWER MONUMENTAL DAM, SNAKE RIVER, WASHINGTON: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Div. North Pacific, Bonneville, Oreg. Hydraulic Lab.
A. J. Chanda, and L. Z. Perkins.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-000 331. Price $6.00 in paper copy, $2.25 in microfiche. Technical Report No. 102-1, May 1974. 132 p, 98 fig, 8 tab, 4 ref.

Descriptors: *Model studies, *Hydraulic models, *Dams, Structures, Hydarulic structures, Diversion structures, Dam design, Tailwater, Cofferdams, Fish passages, Hydraulic similitude, Hydraulics, Civil engineering.
Identifiers: *Lower Monumental Dam(Wash).

Lower Monumental Dam is located 41.6 mi above the mouth of the Snake River and 35 mi northeast of Pasco, Washington. Maximum head on the project is 103 ft; the project design discharge is 850,000 cfs. Excavation requirements, diversion plans, structures locations, and methods of operation were studied in a 1:100-scale model that reproduced 2.4 mi of river channel and pertinent overbank topography. The first-step cofferdam and diversion channel were designed to protect the work area against discharges to 250,000 cfs. The diversion channel and cofferdams cells were revised and the location of a temporary fishway was determined by means of the model study. Tests of the second-step cofferdam, designed for 200,000 cfs, indicated that the height of four upstream cells should be increased 3 ft, the three downstream cells could be lowered 6 ft, and a small cell should be added upstream from the north temporary fishway entrance. The fish trolley release point was satisfactory. Ice Harbor pool should be regulated to maintain acceptable conditions for fish passage during river flows between 40,000 and 80,000 cfs. Conditions with the structures installed were satisfactory after the pumphouse for auxiliary fish attraction flow was realigned and moved 22.5 ft downstream, a disposal fill on the north shore was eliminated, and an 80-ft-wide berm was excavated to elev 405 downstream for the stilling basin. (Sims-ISWS)
W76-03874

8C. Hydraulic Machinery

UNIQUE DESIGN IDEAS MAY INCREASE BIT LIFE.
World Oil, Gulf Publishing Company, p 67-69, September 1975. 5 fig.

Descriptors: *Drilling equipment, Rotary drilling, Oil wells.
Identifiers: *Drill bit, *Spark drill, *Terra drill, *Continuous chain bit, Downhole changeable bit, Drilling rate.

Four unusual new drill bits are being developed by Sandia Laboratories, Albuquerque, New Mexico to speed drilling and downhole bit life. These new ideas in bit design include the spark drill, terra

drill, continuous chain bit, and downhole changeable bit. Spark drilling seems to have the greatest potential. It involves generation of high voltage sparks between electrode gaps located on the bottom surface of the bit. Sparks are generated around the circumference of the bit to spall or chip the rock as the bit makes contact with the bottom of the hole. The terra drill involves firing projectiles between the spacings of a standard tri-cone roller bit. The projectiles weaken the rock ahead of the bit which then pulverizes fractured segments and cuts the hole to the proper diameter. The continuous chain bit has a cutting surface located on the face of a continuous chain circulating between two sprockets at the bottom and at the top of the bit. As a segment of chain is worn out it is replaced by another segment of chain. The downhole changeable system would rotate a new set of roller cones into place at the bottom of the hole without having to pull the drillstem. (Gass-NWWA)
W76-03523

PULSE TRANSFER GIVES THICKER SLUDGE,
Dorr-Oliver, Inc., Stamford, Conn. Environmental Applications.
For primary bibliographic entry see Field 5D.
W76-03685

GET THE MOST FROM THE FINAL CLARIFIERS,
Envirex Inc., Waukesha, Wis.
For primary bibliographic entry see Field 5D.
W76-03687

CONTROLLING WELL KICKS WHEN SHUT-IN METHODS ARE UNSAFE,
Shell Oil Co., Houston, Tex.
F. J. Fisher, and R. L. Kastor.
World Oil, Vol 181, No 5, p 61-67, October 1975, 5 fig, 1 tab, 7 ref.

Descriptors: *Computer models, Drilling, Wells, Computer programs, *Pumping.
Identifiers: Low choke pressure method, Well kick, Kicking well analysis, KIKSIM computer program, Mud pit level, Well shut-in.

Frequently a drilling well cannot be shut in on a kick without significant danger of causing a subsurface blowout, but control often may be retained by increasing the circulation rate to a predicatble, critical value. Pumping rate control is influenced by the time required to initiate the increased rate and whether or not kill mud is being introduced. Theoretical analysis indicates that in a well that cannot be shut in or killed using a constant bottom hole pressure well control method because of a limiting fracture pressure, a critical circulation rate may exist above which the well can be controlled without exceeding the critical annulus pressure. The circulation rate required may be so high as not to be feasible. The rate can be estimated by utilizing the computer model for any particular configuration. The primary advantage offered by computer analysis is being able to anticipate the courses of action that are open to the operator in the event a kick is encountered. Calculations can yield the estimated circulation rate that would be required to control the well. If the rate is unrealistic to the rig, then the well would have to be shut in to avoid an underground blowout. It also will establish the circumstances under which the well may be safely controlled by increasing the circulation rate to some obtainable level. (Ukayli-NWWA)
W76-03760

TRUMMER TUBE SCREW PUMP.
Effluent and Water Treatment Journal, Vol 15, No 9, p 491, September, 1975. 1 fig.

Descriptors: *Pumps, *Pumping, *Equipment, Hydraulic equipment, Water conveyance, Hydraulic machinery.
Identifiers: Screw pumps, Trummer tube screw pump.

The Trummer tube screw pump was introduced in 1969 by the Trummer Company of Switzerland. The tube screw pump extends the range and application of screw pumps, reduces overall costs, and increases efficiency. The pump consists of an inner and outer tube with the screw flights contained in the space between the two tubes; the assembly is welded together and flange mounted to a bearing at either end. The pumping action is caused by rotation of the complete tube assembly. Novel design features have permitted the following advantages: no exposed rotating flights; elimination of the concrete trough; less smell and no splashing; increased efficiency at low speeds; no jamming at inlet to pump; and, no wear or loss of efficiency at tip of flights. A complete range of pumps is available with capacities up to 4000 liters/s and lifts up to 16 m at inclinations of 30 to 40 degrees. (Orr-FIRL)
W76-03810

PUMPS: APPLICATION AND DESIGN BASICS, PART II,
Clarkson Coll. of Technology, Potsdam, N. Y. Dept. of Chemical Engineering.
N. P. Chermisinoff.
Water and Sewage Works, Vol 122, No 10, p 66-67, October, 1975. 1 fig, 2 tab.

Descriptors: *Pumps, *Pumping, Hydraulics, Hydraulic engineering, Equipment, Hydraulic equipment, Hydraulic machinery, Water conveyance, Design criteria.

Reciprocating pumps are positive-displacement pumps in which the piston movement discharges a specific volume of liquid during each stroke. Direct acting pumps can be simplex units comprising one steam and one liquid piston, or duplex units comprising two steam and two liquid pistons. They have a pulsating discharge. Power pumps involve a crankshaft that is driven from an external electric motor with gears usually located between the drive and crankshaft. Diaphragm pumps are used for large flows of clean or solid-containing fluids. Rotary plunger pumps are single-acting pumps with five to seven plungers positioned in a circle. The following terms are defined to aid in the understanding of various pump design parameters: head, static head, static suction head, static discharge head, total static head, friction head, suction head, discharge head, total head, net positive suction head, static suction lift, suction lift, absolute pressure, barometric pressure, gauge pressure, vacuum, vapor pressure, entrance losses, exit losses, and line losses. (Orr-FIRL)
W76-03819

8D. Soil Mechanics

ANALYSIS OF THE PORE PRESSURE CHANGES FOLLOWING THE EXCAVATION OF A SLOPE,
Hardy (R. M.) and Associates Ltd, Edmonton (Alberta).
K. D. Eigenbrod.
Canadian Geotechnical Journal, Vol 12, No 3, p 429-440, August 1975. 9 fig, 22 ref, 1 append.

Descriptors: *Pore pressure, *Slopes, *Excavation, Equilibrium Negative pore pressure, Effective stress, On-site investigations, Stress analysis, Finite element analysis, Soil physical properties, Strain, Loads(Forces), Groundwater, Stability, Model studies, Landslide, Elastic deformation, Consolidation.
Identifiers: Unloading, Dissipation, Swelling.

In a numerical analysis, the pore pressure changes and the subsequent dissipation of excess pore pressures due to excavation of a slope were calculated. The analytical results of the pore pressure changes due to to unloading of a slope ag reasonably well with pore pressure measurem in comparable embankments. This suggested pore pressures immediately after slope excava can be predicted analytically in homogen materials. The results of an analysis dealing the dissipation of excess pore pressures due t loading can also be substantiated by evidence; however, only few comparable data are available. For many slopes it can be that the time for full dissipation is of the order of magnitude as the time between ex tion and failure. This suggests that many fa might be caused by the delayed equalizatio pore pressures. (Visocky-ISWS)
W76-03752

8G. Materials

NEW LOG DATA GIVE BETTER NORTH WELL COMPLETIONS,
Conoco North Sea, Inc., London (England).
For primary bibliographic entry see Field 4B.
W76-03524

IRON BACTERIA AND RED WATER,
Dearborn Chemical Div., Mich.
For primary bibliographic entry see Field 5B.
W76-03640

MEASURING WATER VELOCITY BY TRASONIC FLOWMETER,
Bureau of Reclamation, Denver, Colo. Hyd Branch.
For primary bibliographic entry see Field 8B.
W76-03749

ADEQUATE FORMATION TESTING REDUCE COMPLETION COSTS,
Halliburton Services, Duncan, Okla.
A. G. Edwards.
World Oil, Vol 181, No 5, p 83-91, October fig, 7 ref.

Descriptors: *Operating costs, *Testing, * procedures, Reservoir storage.
Identifiers: APR tester, OD BT pressure re OD RT-7 temperature recorder, Hookw string, Sour reservoir, Sour gas, *Drill *Drill rigs.

Several methods are available for testin floating or bottom supported drilling rig high pressure sampling equipment permit tion of hydrogen sulfide or carbon dioxi reservoir prior to completing the well systems may be used to perform extensive tion tests. Such systems are being used on both platforms and floating vessels t mine reservoir limits and capabilities. systems being used for testing offshore re that contain H2S are described. These offer the operator a wide choice of equipm can be tailored to the well conditions and reservoir analysis desired. Substantial su completion costs may occur in areas wh production was anticipated, but was not In this case, a well test prior to completio indicate to the operator that high cost, spe rosion resistant materials were not (Ukayli-NWWA)
W76-03759

CONTROLLING WELL KICKS WHEN S METHODS ARE UNSAFE,
Shell Oil Co., Houston, Tex.
For primary bibliographic entry see Field
W76-03760

PVC PIPE IN WATER DISTRIBUTION BILITY AND DURABILITY,
Petrochemicals Co., Inc., Fort Worth, Te

primary bibliographic entry see Field 5F.
6-03830

I. Rapid Excavation

ESSING SPUDDER BITS.
er Well Journal, Vol 29, No 12, p 24-25,
ember 1975.

criptors: Thermal expansion, Thermal proper-
Drilling equipment, Drilling, Water wells,
d mechanics.
ifiers: *Spudder bits, Tempering, Drilling

ystem is proposed for 'dressing' or reworking
'spudder' or percussion water well drilling
The bit is placed in a coal forge and rotated
the cutting end reaches a bright cherry red
r. The bit is then placed in the anvil block for
ading with sledge hammers. The spreading
ld always start at the center of the bit and pull
sludge, as the flow is struck, in the direction
netal is to be worked. As soon as the angle of
tration is established, the bit is further
sed to establish the shape of the wearing sur-
, the reaming edges, the points and to bring the
nto gage. After the bit has cooled, it is ready
ering. The bit is immersed end up in clean
r. It is quickly removed and a streak should be
along the side of the bit down to the point.
er incandescent light, the streak will exhibit
us colors. The color should be allowed to
l down the bit until the dark blue has reached
pper corners and the straw color has reached
cutting surfaces. Then re-immerse the bit to
in the temper. After several sharpenings, the
r courses tend to fill with metal. One method
emoving this is using a U-shaped gouge driven
along the water course while the bit is hot.
er-NWWA)
-03757

Fisheries Engineering

TRIBUTION OF NORTHERN PIKE FIN-
LINGS RAISED IN A MANAGED MARSH
THE PIKE POPULATION OF AN AD-
ENT LAKE,
igan Dept. of Natural Resources, Hastings.
Beyerle, and J. E. Williams.
Fish-Cult, Vol 35, No 2, p 99-103, 1973.

riptors: *Pikes, *Fry, Mortality, Fish
ing, *Michigan.
ifiers: *Long Lake(Mich).

verage of 4827 fingerling pike/yr were marked
tocked in Long Lake (Michigan, USA) for 3
ecutive years. An estimated average of 1339
se pike/year survived to fall of their 1st year.
her with an estimated yearly recruitment of
oung-of-the-year pike from natural reproduc-
an average of 2160 young-of-the-year pike
d in Long Lake each fall. Assuming an an-
0% natural mortality beyond the 1st year and
angling harvest of pike 508 millimeters (20
s) and over in length, it can be calculated that
the lifespan of 1 yr class of marked pike,
sh (3.4% of the fingerlings stocked) will be
sted by anglers. During the same period 84 of
nmarked pike will be harvested, making a
ontribution to the fishery of 250 pike of each
lass, and a total yearly harvest of 250 pike.
3 yr of growth, marked pike in Long Lake
ged 3.5 in longer than the State average, and
rked pike were 2.1 in longer. This rapid
h plus the calculated yearly harvest of less
pike/acre would seem to indicate that the
ng rate of fingerling pike in Long Lake could
reased substantially with great benefit to the
y.–Copyright 1973, Biological Abstracts,

03520

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IX. NUMBERS AND BIOMASS OF BOTTOM FAUNA,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 02H.
W76-03539

WASTEWATER UTILIZATION IN INTEGRATED AQUACULTURE AND AGRICULTURE SYSTEMS,
Agricultural Research Organization, Dor (Israel). Fish and Aquaculture Station.
For primary bibliographic entry see Field 05D.
W76-03543

POLYCULTURAL WASTEWATER RECLAMATION AT CALIFORNIA POLYTECHNIC STATE UNIVERSITY--AN ACADEMIC INSTRUCTIONAL SYSTEM,
California Polytechnic State Univ., San Luis Obispo. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05D.
W76-03567

MINERAL QUALITY OF FISH POND EFFLUENT RELATED TO SOIL PROPERTIES AND CROP PRODUCTION,
Arkansas Univ., Fayetteville.
For primary bibliographic entry see Field 03C.
W76-03569

THE DIALECTICS OF A PROPOSAL ON BIOLOGICAL CONTROL OF EUTROPHICATION IN SEWAGE LAGOONS,
National Taiwan Univ., Taipei.
For primary bibliographic entry see Field 05C.
W76-03570

CRITICAL VARIABLES IN FOOD-ITEM POPULATION DYNAMICS IN A WASTE-WATER AQUACULTURE SYSTEM,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 03C.
W76-03572

THE FEASIBILITY OF PENAEID SHRIMP CULTURE IN BRACKISH PONDS RECEIVING TREATED SEWAGE EFFLUENT,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 05C.
W76-03573

PRINCIPLES OF SEWAGE TREATMENT THROUGH UTILIZATION IN FISH PONDS,
National Agricultural Quality Control Inst., Budapest (Hungary).
For primary bibliographic entry see Field 05D.
W76-03576

POTENTIAL EFFECTS OF AQUACULTURE ON INSHORE COASTAL WATERS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 05C.
W76-03585

THE EMERGENCY MARINE FISHERIES PROTECTION ACT OF 1974, S 1988,
North Carolina Univ. at Chapel Hill.
For primary bibliographic entry see Field 06E.
W76-03623

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SELECTED WATER RESOURCES ABSTRACTS

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MAY 1, 1976

W76-04001 -- W76-04500
CODEN: SWRABW

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 9
MAY 1, 1976

W76-04001 -- W76-04500

tary of the U.S. Department of the Interior has de-
nat the publication of this periodical is necessary in the
n of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

ected Water Resources Abstracts, a semimonthly urnal, includes abstracts of current and earlier pertinent graphs, journal articles, reports, and other publication s. The contents of these documents cover the water- l aspects of the life, physical, and social sciences as s related engineering and legal aspects of the charac- s, conservation, control, use, or management of water. bstract includes a full bibliographical citation and a set criptors or identifiers which are listed in the **Water rces Thesaurus.** Each abstract entry is classified into ds and 60 groups similar to the water resources re- categories established by the Committee on Water rces Research of the Federal Council for Science and ology.

C IS NOT PRESENTLY IN A POSITION TO PROVIDE ES OF DOCUMENTS ABSTRACTED IN THIS JOUR- Sufficient bibliographic information is given to enable s to order the desired documents from local libraries r sources.

ed Water Resources Abstracts is designed to serve entific and technical information needs of scientists, ers, and managers as one of several planned services Water Resources Scientific Information Center C). The Center was established by the Secretary of the and has been designated by the Federal Council for e and Technology to serve the water resources com- by improving the communication of water-related ch results. The Center is pursuing this objective by co- ing and supplementing the existing scientific and tech- formation activities associated with active research vestigation program in water resources.

vide WRSIC with input, selected organizations with water resources research programs are supported as s of competence" responsible for selecting, abstract- ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General, Precipitation, Snow, Ice, and Frost, Evaporation and Transpiration, Streamflow and Runoff, Groundwater, Water in Soils, Lakes, Water in Plants, Erosion and Sedimentation; Chemical Processes; Estuaries

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion, Water Yield Improvement, Use of Water of Impaired Quality, Conservation in Domestic and Municipal Use, Conservation in Industry, Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants, Sources of Pollution, Effects of Pollution, Waste Treatment Processes, Ultimate Disposal of Wastes, Water Treatment and Quality Alteration, Water Quality Control

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning, Evaluation Process, Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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10 SCIENTIFIC AND TECHNICAL INFORMATION
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AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

. WATER CYCLE

REDICTIVE USE OF CATCHMENT OUT-UTS,
onash Univ., Clayton (Australia). Dept. of Civil ngineering.
or primary bibliographic entry see Field 4A.
76-04145

A. General

REDICTION IN CATCHMENT HYDROLOGY.
ustralian Academy of Science, Camberra.
National Symposium on Hydrology, 25-27 ovember 1975. Australian Academy of Science, nberra, Australia, (1975). 482 p, Chapman, G., and Dunin, F.X. (eds).

escriptors: *Conferences, *Model studies, Watersheds(Basins), *Forecasting, *Reviews, ater balance, Water quality, Synthetic hydrolo-, Time series analysis, Hydrologic data, Rain-l-runoff relationships, Urban hydrology, atershed management.

e twenty-one invited papers are presented. The me of the symposium was an examination of extent to which useful predictions can be made a range of situations, with emphasis on the com-xities of the real world. Topics covered include ysical processes in surface hydrology, chment models (including application to urban as), water quality models, input and output se-s, data needs, and trends in catchment delling. (See W76-04129 thru W76-04147) SIRO)
76-04128

MERICAL METHODS FOR PREDICTING ECIPITATION IN CATCHMENT HYDROLO-,
stralian Numerical Meteorology Research Cen- Melbourne (Australia).
primary bibliographic entry see Field 2B.
6-04129

THODS OF DETERMINING AREAL RAIN-LL FROM OBSERVED DATA,
eau of Meteorology, Melbourne (Australia).
primary bibliographic entry see Field 2B.
6-04130

E INTERCEPTION PROCESS,
primary bibliographic entry see Field 2I.
6-04131

ILTRATION OF WATER INTO SOIL,
mmonwealth Sceintific and Industrial Research anization, Canberra (Australia). Div. of Land Research.
primary bibliographic entry see Field 2G.
-04132

VEMENT OF SOIL AND SHALLOW OUNDWATER,
mmonwealth Scientific and Industrial Research anization, Wembley (Australia). Div. of Land earch Management.
primary bibliographic entry see Field 2G.
-04133

RLAND FLOW,
ourne and Metropolitan Board of Works Mel-ne (Australia).
primary bibliographic entry see Field 2E.
-04134

STREAMFLOW IN CATCHMENT MODELLING,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-04135

TRANSPORT OF MATERIALS IN STREAMS,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-04136

EVAPORATION FROM CATCHMENTS,
Commonwealth Scientific and Industrial Research Organization, Mordialloc (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 2D.
W76-04137

SPECIAL CHARACTERISTICS OF URBAN HYDROLOGY,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Progeam.
M. B. McPherson.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 239-255. 1 fig, 1 tab, 48 ref.

Descriptors: *Reviews, *Model studies, *Urban hydrology, Urbanization, Urban runoff, Cities, Rainfall-runoff relationships, Design data, United States.

The field of urban hydrology is distinguished from classical hydrology both in terms of subject matter and in the organization and support of research. A review is provided of current activity and expected directions in the field in the U.S.A. The more widely used models are classified into planning, design/analysis, and operation types, and recent developments in the formulation and use of each type are reviewed, together with recent attempts to evaluate and compare them. Considerations affecting the selection of input precipitation data for a chosen model are discussed. (See also W76-04128) (CSIRO)
W76-04138

CATCHMENT MODELS FOR URBAN AREAS,
Snowy Mountains Engineering Corp., Cooma (Australia).
A. P. Aitken.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 257-275. 2 fig, 20 ref.

Descriptors: *Model studies, *Urban hydrology, *Australia, Cities, *Urban runoff, Rainfall-runoff relationships, Design data, *Reviews.

A general review of problems associated with catchment modelling in urban areas is presented. The particular characteristics of Australian urban catchments are discussed, and appropriate existing models suggested for use in relation to the various types of problems encountered. Attention is drawn to the deficiency in available data in Australia, and in research efforts directed towards determining accuracy requirements for the models. (See also W76-04128) (CSIRO)
W76-04139

USE OF PHYSICAL PROCESS MODELS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
F. X. Dunin.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, 1975. p 277-291. 1 fig, 27 ref.

Descriptors: *Reviews, *Mathematical models, *Watersheds(Basins), *Rainfall-runoff relationships, Model studies, Watershed management, Education, Research and development.

Process models are those in which hydrologic processes occurring within a catchment are represented as equations whose parameters may be derived from measurable features of the catchment; typically the catchment is conceived as a series of water stores with flows between them whose properties are based on the principles of energy exchanges and mass transport. Concepts associated with the development of such models are reviewed, and their potential uses in predicting, analysing and managing catchment responses are discussed. It is suggested that they have particular advantages in education, and in co-ordination of research and practical issues. Potential future developments in the field are indicated. (See also W76-04128) (CSIRO)
W76-04140

EMPIRICAL METHODS AND APPROXIMATIONS IN THE DETERMINATION OF CATCHMENT RESPONSE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 4A.
W76-04141

MODEL EVALUATION, TESTING AND PARAMETERS ESTIMATION IN HYDROLOGY,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. H. Pilgrim.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 305-333, 3 fig, 76 ref.

Descriptors: *Reviews, *Model studies, *Testing procedures, *Watersheds(Basins), On-site tests, Evaluation, Forecasting, Calibrations, Water yield, Rainfall-runoff relationships.

Four levels of evaluation are necessary before a model should be applied to predict the output from a catchment. These are: rational evaluation of the structure of the model itself, estimation of the parameters for the particular catchment, testing the fitted model for accuracy, and estimating its range of applicability. In a review of evaluation methods, emphasis is placed on the general principles of calibration and testing. All assessments must be made relative to the particular objectives of the model application. (See also W76-04128) (CSIRO)
W76-04142

MODELLING WATER QUALITY,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W76-04143

SYNTHETIC INPUT DATA TIME SERIES FOR CATCHMENT MODEL TESTING,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
M. J. Goodspeed, and C. L. Pierrehumbert.
In: Predicition in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 359-370, 1 tab, 30 ref.

Descriptors: *Reveiws, *Model studies, *Watersheds(Basins), *Testing procedures, *Synthetic hydrology, Rainfall, Statistical methods, Forecasting, Rainfall-runoff relationships, Rainfall distribution, *Time studies analysis, Stochastic processes, Probability.

Field 2—WATER CYCLE

Group 2A—General

The use of synthetic input data for catchment model validation and parameter estimation is outlined. Attention is directed principally to the generation of synthetic precipitation data. These procedures are usually considered in relation to events at a single point where historical data are characterised statistically and used as the basis for projection. However, data generated as a result of spatial interpolation or regionalization of a small number of events are equally synthetic, and some techniques used in these processes are discussed. The stochastic processes and probability distributions considered appropriate vary markedly with the time interval between samples used and some examples of these are given. An example of the generation of synthetic data for model optimization is also presented. (See also W76-04128) (CSIRO)
W76-04144

DATA NEEDS, AQUISITION, AND AVAILABILITY FOR HYDROLOGIC MODELS,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 7C.
W76-04146

TRENDS IN CATCHMENT MODELLING,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
T. G. Chapman.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 459-482, 4 fig, 44 ref

Descriptors: *Reviews, *Model studies, *Forecasting, *Watersheds(Basins).

Recent progress in catchment prediction is reviewed with the aim of suggesting areas for future development. The trend towards models with a structure related to the physics of hydrological processes is expected to continue, but it will lead to only marginal advances in prediction capability unless more emphasis is placed on evaluation of catchment parameters. The constraints on significant advances will then be data aquisition and the cost of implementing more realistic models. Problems associated with extending predictions to a real (as opposed to a time-invariant) catchment are also considered. (See also W76-04128) (CSIRO)
W76-04147

RESEARCH PROGRAM - HYDROLOGY RESEARCH DIVISION - SUMMARIES OF PROGRESS AND SHORT RESEARCH REPORTS.
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
Report Series No 42, 1975. 120 p, 29 fig, 10 tab.

Descriptors: *Hydrology, *Projects, *Programs, *Research and development, Forecasting, Model studies, *Canada.
Identifiers: *Hydrogeologic research, Geophysical studies, Groundwater studies, Forecast models, GOWN program.

Presented are a series of brief papers and reports on various aspects of research programs in progress in the hydrology research division, of the Water Resources Branch, Inland Waters Directorate, Environment Canada. These programs are involved in developing hydrologic techniques and methodologies for water resource management, and identifying operational areas in the water resource field where there are needs for research and implementing appropriate research projects and programs. (Environment Canada)
W76-04239

USES OF WATER RESOURCES DATA,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04255

THE EFFECT OF CLIMATE ON THE CHEMISTRY OF CARBONATE GROUNDWATER,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 2F.
W76-04297

A GENERALIZED TENSOR FORMULATION OF ATMOSPHERE AND SEAS DYNAMICS,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
L. M. Avis, R. E. Turner, and T. H. Rees.
Available from the National Technical Information Service, Springfield, Va 22161. Technical Report NASA TR R-441, September 1975. 64 p, 11 ref, 6 append.

Descriptors: *Fluid mechanics, *Model studies, *Mathematical models, Atmosphere, Oceans, Computer models, Simulation analysis, Numerical analysis, Equations, Gravity waves, Mixing, Movement.
Identifiers: Time-dependent metrics, Geophysical fluids.

A new generalized mathematical model was developed for simulation of the dynamics and transport of both the atmosphere and seas. A nearly horizontal bottom coordinate surface conforms to the land-to-air interface and the sea-floor-to-water interface, which simplifies computations. General vertical motion of the other quasi-horizontal coordinate surfaces was allowed; thus, external gravity waves can be represented by the top coordinate surface, and meteorological fronts and inversion layers in the atmosphere and refractive layers in the seas can be represented with enhanced resolution by the internal quasi-horizontal coordinate surfaces. A tensor reformulation of the standard subgrid mixing theory departed significantly from the standard theory in allowing, as a solution under adiabatic conditions, rigid-body rotation of the atmosphere. (Sims-ISWS)
W76-04317

DIGITAL MODEL SIMULATION OF THE GLACIAL-OUTWASH AQUIFER AT DAYTON, OHIO.
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 2F.
W76-04409

2B. Precipitation

CLIMATIC ASPECTS OF FROST WEATHERING IN THE UPPER MOUNTAINOUS REGIONS, (IN GERMAN),
Bern Univ. (Switzerland). Geography Institut.
For primary bibliographic entry see Field 2C.
W76-04020

CONTINENTAL ICE SHEETS: CONDITIONS FOR GROWTH,
Colorado Univ., Boulder. Dept. of Geography; and Colorado Univ., Nederland. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W76-04100

STORM WAVE CLIMATES AT CAPE HATTERAS, NORTH CAROLINA: RECENT SECULAR VARIATIONS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2L.
W76-04101

NUMERICAL METHODS FOR PREDICTIN PRECIPITATION IN CATCHMENT HYDROLOGY,
Australian Numerical Meteorology Research Centre, Melbourne (Australia).
D. J. Gauntlett, and L. M. Leslie.
In: Prediction in Catchment Hydrology. Australi Academy of Science, Canberra, Australia, 1975 33-45. 5 fig, 25 ref.

Descriptors: *Reviews, *Forecasting, *Rainfa *Numerical analysis, *Model studies, Weat forecasting, Synoptic analys Watersheds(Basins).

The problem and potential of using numeri weather prediction models to forecast, in a dwt ministic sense, meso-scale rainfall for catchm purposes and reviewed. A broad techni framework is presently available which may in long term provide a capability for short-range p diction far in excess of present-day synoptic statistical methods. However, refinements necessary in certain key areas, notably in the sc of resolution relative to that required catchment studies, in determining methodol for specifying initial states in the meso-scale, in understanding the physical factors contribu to the precipitation process. (See also W76-04 (CSIRO)
W76-04129

METHODS OF DETERMINING AREAL RA FALL FROM OBSERVED DATA,
Bureau of Meteorology, Melbourne (Australia).
A. J. Hall, and P. A. Barclay.
Hydrology, Australian Academy of Science, berra, Australia, 1975. p 47-57. 1 tab, 49 ref.

Descriptors: *Reviews, *Estimating, *Rain *Measurement, *Radar, Watersheds(Bas Model studies, Rainfall-runoff relationships, fall disposition, Rain gages.

An accurate assessment of areal rainfall is a ne sary basic input to rainfall-runoff models, par larly conceptual models which emphasis complete water balance. The success of models is restricted by the normally sp unevenly distributed network of point ga available. The more commonly used metho calculating areal rainfall from point gauge dat listed and compared, and the errors incurre their use are discussed. Radar measuremen areal rainfall is considered as an alternative. also W76-04128) (CSIRO)
W76-04130

FURTHER CLIMATOLOGICAL STUDIES BAFFIN ISLAND, NORTHWEST TERR RIES,
Department of the Environment, O (Ontario). Water Resources Branch; and D ment of the Environment, Ottawa (Ontario land Waters Directorate.
R. G. Barry.
Technical Bulletin No 65, 1974. 54 p, 53 fig, 1 18 ref, append.

Descriptors: *Climat *Precipitation(Atmospheric), *Evaporation, tic, Methodology, Analytical techniques, St cal methods, *Classification, Moisture, * *Canada.
Identifiers: Moisture flux divergence, Hori vapour transport, *Baffin Island(NWT), Mo budget estimates, Synoptic weathermaps.

This report concludes the program of climag cal investigations of Baffin Island begun i tember 1966 as a part of the Baffin Island p of the Department of Energy, Mines

Resources and continued under project 16 of the and-based ice studies. Results are presented of vork between October 1968 and July 1971 at the nstitute of Arctic and Alpine Research, Universi- y of Colorado, Boulder. The objectives of this tudy are to provide information on the moisture lux divergence and sources of precipitation over ne Eastern Canadian Arctic. A classification of ynoptic weather maps into types is also included. Environment Canada)
/76-04259

GENERALIZED TENSOR FORMULATION F ATMOSPHERE AND SEAS DYNAMICS,
ational Aeronautics and Space Administration, angley Station, Va. Langley Research Center.
or primary bibliographic entry see Field 2A.
/76-04317

C. Snow, Ice, and Frost

HEMICAL COMPOSITION OF SNOW IN THE AST CENTRAL SIERRA NEVADA,
ax C. Fleishmann Coll. of Agriculture, Reno, ev.
C. Brown, and C. M. Skau.
vailable from the National Technical Informa- n Service, Springfield, Va 22161 as PB-249 495, 50 in paper copy, $2.25 in microfiche. Nevada nter for Water Resources Research, Desert search Institute, Reno, Publication AG-1, vember 1975. 13 p, 1 fig, 4 tab, 14 ref. OWRT 062-NEV(1). 14-31-0001-5028.

scriptors: Snow, Snow melt, *Nitrogen, hosphorus, *Nevada, Sampling, Water quality, emical properties, Pollutant identification.
ntifiers: *Sierra Nevada Mountains(Nev).

e chemical quality of snowfall in the east-cen- Sierra Nevada Mountains was measured four es at twenty-six sampling points during the iod January to April, 1975. Mean concentra- is (ppm) and total production (lbs/mi sq) of ven major chemical constituents are reported. ese values were related to six sampling site racteristics, using simple correlation niques, to determine the factors which in- nce the chemical variability of snowfall over area. Chemical concentrations in the snow e are, apparently, much lower than for cipitation reported in other parts of the ntry. Nitrogen and phosphorus concentrations, vever, are similar to those found in small, east- Sierra streams. The chemical concentrations in wfall exhibit little variability between sampling s. This suggests atmospheric concentrations of e constituents are relatively uniform over the , with localized human activity having, ap- ntly little influence. The dominant factor caus- variation of winter production values (lbs/mi between sites is simply the amount of ipitation. (Fallon-Nevada)
-04018

MATIC ASPECTS OF FROST WEATHER- IN THE UPPER MOUNTAINOUS RE- NS, (IN GERMAN),
Univ. (Switzerland). Geography Institut.
athys.
Naturforsch Ges Bern. 31: 49-62. 1974.

riptors: *Temperature, Mountains, Frost ac- Climate, Humidity, *Weathering, *Frost ng, Fog.
ifiers: *Switzerland.

hermal effects of the atmosphere on the litho- e on the eastern ridge of the Jungfrau peak zerland) were studied. Variations in the sur- emperatures of rocks are greater than those temperatures. Even in the permafrost re- rock temperatures may be 4 times those of r. Heat and cold are moderated toward the center of a rock. At a depth of 40 cm when the surface temperature was 44C, the inside of a rock was 6C and the temperatures took 9 h to equalize. The southern slope froze and thawed on 196 days in 1972 while this occurred on only 22 days on the northern slope. Dark surfaces at 3700 m reached 43C and light areas reached 33C. The amplifying and inhibiting effects of wind, fog and humidity are also discussed. Compressive stress due to as many as 6 freezing and thawing cycles per day lead to fatigue in rocks and fissures and layers are formed allowing deeper penetration of heat and cold.--Copyright 1975, Biological Abstracts, Inc.
W76-04020

CONTINENTAL ICE SHEETS: CONDITIONS FOR GROWTH,
Colorado Univ., Boulder. Dept. of Geography; and Colorado Univ., Nederland. Inst. of Arctic and Alpine Research.
R. G. Barry, J. T. Andrews, and M. A. Mahaffy.
Science, Vol. 190, No. 4218, p 979-981, December 5, 1975. 2 fig, 37 ref. NSF GA-40248.

Descriptors: *Ice cover, *Remote sensing, *Climatology, *Canada, Glaciation, Temperature, Snow, Glaciers, Lichens, Model studies, Mathematical models, Climatic data, Cold regions, Water levels, Sea level.
Identifiers: *Continental ice sheets, *Baffin Island, Labrador, ERTS.

The conditions required for the development of major ice sheets in eastern Canada appear to have been approximated by those of the Little Ice Age in the 17th through the 19th centuries. Former extensive snowbanks from this period have been mapped from lichen-free terrain visible on Earth Resources Technology Satellite imagery. The climatic changes required to initiate the necessary snow line lowering may involve only a minor summer cooling. Simulations with an ice-flow model reproduced plausible ice centers, but the rate of ice sheet buildup is slower than that suggested by geological evidence of world sea level lowering from 120,000 to 115,000 years before the present. (Sims-ISWS)
W76-04100

SPLINE APPROXIMATION TO THE FREEZING OF WATER IN A CYLINDRICAL HOLE DRILLED IN AN ICE SHEET,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. Takagi.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A006 581, $3.50 in paper copy, $2.25 in microfiche. Research Report 328, February 1975. 13 p, 2 ref, 1 append.

Descriptors: *Boreholes, *Ice, *Glaciology, *Freezing, Model studies, Mathematical models, Equations, Glaciers, Cold regions.
Identifiers: *Ice sheets.

An interpolation continuous up to the first-order derivatives was needed to solve the problem of freeze-back of water in a cylindrical borehole drilled in an ice sheet, because of the first-order derivatives were used in the formulation of the movement of the freezing front. The requirement was met by use of a parabolic spline. The Crank-Nicholson formula was used to set up the predictor-corrector scheme of time integration. Several iterations were needed to advance one step in time because of the implicit nature of the Crank-Nicholson formula and the nonlinearly involved in the freezing problem. (Sims-ISWS)
W76-04105

ANALYSIS OF THE FREEZEBACK OF WATER IN A CYLINDRICAL BOREHOLE DRILLED IN AN ICE SHEET,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. Takagi.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 693, $3.50 in paper copy, $2.25 in microfiche. Research Report 323, September 1974. 12 p, 2 fig, 2 ref.

Descriptors: *Boreholes, *Ice, *Glaciology, *Freezing, Model studies, Mathematical models, Equations, Glaciers, Cold regions.
Identifiers: *Ice sheets.

The rigorous solution was presented of the freezeback of water in a cylindrical borehole drilled in an ice sheet floating on water, based on the assumptions that the temperature distribution does not depend on the vertical direction and the temperature of the water in the borehole is the freezing temperature. The solution was found by using the thickness of the newborn ice in place of time. Because of the complexity of the analysis, the solution can be found only for the first few terms of the series solution. Numerical computation of the solution thus found by use of the first few terms of the series solution yielded the growth curve of the newborn ice that reaches maximum at a certain time. The solution ceased to be valid before the time of the maximum is reached. (Sims-ISWS)
W76-04106

DEFORMATION AND FLOW OF BARNES ICE CAP - BAFFIN ISLAND,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
G. Holdsworth.
Scientific Series No 52, 1975, 19 p, 17 fig, 5 tab, 21 ref.

Descriptors: *Ice, *Methodology, *Instrumentation, Mathematical studies, Flow measurement, Surveys, Migration, Surges, Stations, Surfaces, Velocity, *Canada.
Identifiers: *Barnes Ice Cap, *Baffin Island, *Flow Law, Mass balance measurements, Strain rates, Divide, Northwest Territories.

Measurements taken in 1970 and 1971 of the positions of 43 surface stations along a transect (10.4 km long) from the divide to the northeast margin of the south dome of Barnes Ice Cap, have enabled surface velocities and strain rates to be computed along surface 'flow lines' generated from the velocity distribution. Using a variation of a method developed by Budd (1969), the parameters in the flow law are determined for the stress range. From the measured vertical velocities of the ice and the buildup of superimposed ice over the period 1970-73, it appears that this part of the ice-cap surface is rising. This is not necessarily the case elsewhere or when averaging is done over longer periods of time. More data are required before it is known whether the divide is stable or is still migrating, as the result of a surge. (Environment Canada)
W76-04151

GLACIER SURVEYS IN BRITISH COLUMBIA - 1970,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
I. A. Reid, and J. O. G. Charbonneau.
Report series No 32, 1975, 23 p, 11 fig, 41 tab, 6 ref, 6 maps.

Descriptors: *Glaciers, *Surveys, Streamflow, Maps, Runoff, Methodology, Photogrammetry, Analytical techniques, Water quantity, On-site investigations, *Canada.
Identifiers: Volumetric changes, Directional changes, Areal changes, Linear changes, *British Columbia, Sentinel Glacier, Kokanee Glacier,

Nadahini Glacier, Sphinx Glacier, Sentinel Glacier.

Glaciers act as natural regulators, storing water in winter and releasing it in summer. To gain some understanding of this phenomenon and the contribuiton which glacier surveys in 1945. The earlier surveys offered some clue to the role of the glacier, but the data collected were not sufficient to provide the overall picture. Following adoption of photogrammetric survey techniques, however, the glacier surveys have evolved to the extent that it is now feasible to produce a series of maps from which the linear, areal, directional and volumetric changes can be determined. The surveys have revealed that the glaciers, in general, are becoming smaller in size; hence the regulation effect is diminishing. (Environment Canada)
W76-04154

LIGHT TRANSMISSION THROUGH SNOW AND ICE,
Department of the Environment, Burlington (Ontario). Inland Waters Branch.
R. J. Maguire.
Technical Bulletin No 91, 1975. 4 p, 1 fig, 2 tab, 13 ref.

Descriptors: *Snow, *Ice, *Photosynthesis, Lakes, Measurement, Light, Instrumentation, Forecasting.
Identifiers: *Light transmission, Oxygen concentration, Illumination, Thickness, Sensors, Pyranometers.

The transmission of photosynthetically active radiation (400-700 nm) by snow and ice has been examined and extinction coefficients have been determined for clear ice, cloudy ice, soft new snow and hard powder snow. These values have been used to predict, to a satisfactory degree, the transmission of light by snow - ice systems of varying composition and thickness. (Environment Canada)
W76-04178

EFFECTS OF ICE AND SNOW COVER ON TRANSMISSION OF LIGHT IN LAKES,
Department of the Environment, Burlington (Ontario). Inland Waters Directorate.
R. J. Maguire.
Scientific Series, No 54, 1975. 24 p, 1 fig, 4 tab, 65 ref.

Descriptors: *Ice, *Snow cover, *Lakes, Effects, Temperature, Transportation, Biology, *Photosynthesis, Absorption, Filters, Equations, Depth, Freshwater, Migration, Cycles, Light, *Canada, Reviews, Measurement, Instrumentation, Iced lakes.
Identifiers: *Light transmission, Manitoba, Meteorological conditions, Strata, Water mass, Chemical constitution, Albedo, Morphometry, Pyranometers.

A review is presented of some chemical and biochemical effects of ice and snow cover on lakes. Particular attention is given to the attenuation of photosynthetically active light by ice and snow cover, and the resulting decrease in the amount of dissolved oxygen in lakes. Instrumental methods of light measurement in the field are discussed briefly, and an account is given of the complex terminology of light measurement. (Environment Canada)
W76-04179

PREDICTING PROFILES OF SNOWDRIFTS IN TOPOGRAPHIC CATCHMENTS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
R. D. Tabler.
In: Proceedings, Western Snow Conference (San Diego, California; April 1975), 43, p 87-97. (1975) 11 fig, 1 tab, 3 ref.

Descriptors: *Snowdrifts, *Snowpacks, Slopes, Highways, Roadbanks, Embankments, *Snow cover, *Computer programs, *Blizzards, Roads, *Snow removal, Topography, Mountains, Road design, Shear stress, Strip mines, Regression analysis, Snow surveys, Water yield improvement, Snow management, Land reclamation, Wyoming, Colorado.
Identifiers: Snow control, Snow protection, Blowing snow, Drifting snow, Terrain reshaping, Strip-mine rehabilitation, Snow accumulation.

A regression model was developed that requires only terrain data to estimate snowdrift profiles. Results from sites in Wyoming and Colorado show drift slopes to be influenced by the terrain from 45 m (150 ft) upwind to an equal distance downwind of the catchment lip. Observed drift profiles are closely duplicated when the regression equation is used to predict the slope of successive profile increments. Results are compared to those of Finney's wind tunnel experience (1939). The Wyoming Highway Department is making this analysis a part of their earthwork computer program to help design drift-free roads. Among many other possible applications is the development of criteria for reshaping strip-mined terrain to maximize on-site retention of snowfall and regulate its areal distribution. A program listing is given for the Hewlett-Packard 9820A calculator and 9826A plotter. (Forest Service)
W76-04288

THE ENERGIES OF THE PLASTIC DEFORMATION OF PACK ICE BY RIDGING,
Washington Univ., Seattle. Artic Ice Study.
D. A. Rothrock.
Journal of Geophysical Research, Vol 80, No 33, p 4514-4519, November 10, 1975. 7 fig, 1 tab, 15 ref. NSF OPP71-04031.

Descriptors: *Sea ice, *Plastic deformation, *Model studies, *Oceans, Ice, Ice loads, Pressure, Growth rates, Mathematical models, Computer models, Cold regions, Oceanography, Energy.
Identifiers: *Pressure ridges, *Sea-ice thickness.

A large-scale area of pack ice contains ice of various thicknesses from zero to many meters. As the area deforms, thin ice is ridged into thicker ice, in a way that depends on the strain rate and the instantaneous thickness distribution. By equating the plastic work to the production of gravitational potential energy and the frictional dissipation in this ridging process, the yield curve for plastic deformation of the ice pack was related to the way ice thicknesses are redistributed by ridging. (Sims-ISWS)
W76-04299

THE FLOW OF A TWO-LAYER FLUID OVER TOPOGRAY IN A POLAR OCEAN,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
For primary bibliographic entry see Field 2L.
W76-04304

SIMULATED SNOWDRIFT PATTERNS--EVALUATION OF GEOMETRIC MODELING CRITERIA FOR A THREE DIMENSIONAL STRUCTURE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. J. Calkins.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A007 735, $3.25 in paper copy, $2.25 in microfiche. Special Report 219, March 1975. 15 p, 3 fig, 1 tab, 12 ref, append.

Descriptors: *Snow, *Winds, *Model studies, *Scaling, Hydraulic models, Laboratory tests, Flumes, Sands, Water Snowpacks, Hydraulic similitude, Reynolds number, Froude number.
Identifiers: *Snowdrift patterns, Snow deposition, Model scales, Rosby number, Peclet number.

Simulated drifting snow patterns were examine for a single structure using fine sand and water in hydraulic flume. Three models of the structu were constructed at different scales and the e perimental data revealed that model scale had ve little effect on the areal distribution patterns. Flo velocity also had very limited influence on t drift patterns, provided the channel velocity w greater than the threshold velocity of the sand p ticle. Lengthening the duration of the test ru made it easier to distinguish the patterns but d not change their shape. The experimental data su gested that modeling under the Reynolds numb independence is satisfactory. (Sims-ISWS)
W76-04313

CASCADE PASSES AVALANCHE ATL/ PART I: CHINOOK, CAYUSE, WHITE A SNOQUALMIE PASSES,
Washington Univ., Seattle. Dept. of Civil I gineering; and Washington Div., Seat Geophysics Programs.
For primary bibliographic entry see Field 7C.
W76-04318

DEVELOPMENT OF A SEA-ICE THICKNE GAGE--AN ATTEMPT TO USE SHEAR WAV
Rhode Island Univ., Kingston. Dept. of Ocean gineering.
J. H. Getman, and M. B. Moffett.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as AD-A 599, $7.25 in paper copy, $2.5 in microfiche. port No GC-D-44-75, May 1973. 209 p, 47 fi tab, 19 ref, 3 append. DOT-CG-24, 136-A.

Descriptors: *Ice, Sea ice, *Measurem *Acoustics, *Arctic, Instrumentation, On tests, Cold regions.
Identifiers: *Sea-ice thickness, *Shear wa Acoustic measurements.

An experimental apparatus for the measure of the thickness of sea-ice by the use of a s wave reflection technique was designed and structed. The apparatus was tested extensive the Arctic during the summer of 1972. A portio the apparatus, the horizontal impact sou produced reliable and repeatable excitation o ice. Unfortunately, the measurement of thickness of sea ice by the use of a shear w reflection technique was not as simple as wa ticipated, primarily due to the difficulty properly exciting the ice and to the mode co sion of the acoustic energy by external and i nal features of the ice. (Sims-ISWS)
W76-04320

CORRELATION ANALYSIS OF WIND AND DRIFT DATA TAKEN AT LINCOLN BAY 19
Defence Research Establishment, Ot (Ontario).
V. Jones.
Available from the National Technical Info tion Service, Springfield, Va 22161 as AD-089, $3.50 in paper copy, $2.25 in microf Technical Note 74-34, January 1975. 7 p, 1 t ref, 2 append.

Descriptors: *Winds, *Sea ice, *Correlation a sis, *Arctic, Ice, Regression analysis, M matics, Computer programs, Coriolis f Movement, Cold regions.
Identifiers: *Ice drift.

A set of programs were written to analyze and ice drift speed correlations in the data tak Lincoln Bay in 1972. The maximum correlatio each station indicated that about 20% of the can be attributed to wind. The effects of tim and Coriolis force were examined, but due t complexity of the problem no generalization floe measurement could be made. (Sims-ISW
W76-04322

ROBLEMS OF CALCULATING THE THER-AL RADIATION OF MULTILAYERED TRUCTURES OF THE ICE AND SNOW TYPES Y MEANS OF ORIENTED GRAPHS USING AN LECTRONIC COMPUTER,
. D. Rayev, Ye. A. Sharkov, T. A. Shiryayeva, d V. S. Etkin.
vailable from the National Technical Informa-n Service, Springfield, Va 22161 as N74-33885, .00 in paper copy, $2.25 in microfiche. NASA chnical Translation F-15,965, October 1974. 23 15 fig, 5 ref. Translated from Russian.

escriptors: *Snow, *Ice, *Thermal radiation, ta processing, Computer programs, Computers, odel studies, Mathematical models, Radiation, ermal properties.

examination was made of a method of calculat-the radio emission of multilayered structures h oriented graphs, computer-aided. This thod makes it possible with small outlays of chine time to analyze the radio emission of mplex layered structures with any number of ers in thickness and arbitrary electrical parame-s. As an example, the calculation and analysis the radio emission of layered structures of w-ice-water, water-ice, and ice-ground types re carried out. (Sims-ISWS)
6-04324

IMINAL JURISDICTION OVER ARCTIC ICE ANDS: UNITED STATES V. ESCAMILLA,
primary bibliographic entry see Field 6E.
6-04341

E DYNAMICS IN THE CANADIAN CHIPELAGO AND ADJACENT ARCTIC SIN AS DETERMINED BY ERTS-1 OBSER-TIONS,
partment of the Environment, Ottawa tario).
D. Ramseier, W. J. Campbell, W. F. Weeks, L. pier-Arsenault, and K. L. Wilson.
Canada's Continental Margins and Offshore roleum Exploration: Canadian Society of roleum Geologists Memoir 4, p 853-877, May 5. 16 fig, 1 tab, 13 ref.

criptors: *Sea ice, Movement, *Arctic Ocean, acking techniques, *Satellites(Artificial), Aeri-hotography, Remote sensing, Data collections, togammetry, Mapping.
ntifiers: *Ice dynamics, *Canadian hipelago, *ERTS-1, Ice movement, Ice melt.

TS-1 'Quicklook' imagery for the period March November 1973 has been utilized to study sea n the Canadian archipelago and in the adjacent tic basin. The imagery, which provides exten-coverage of the area of interest, contains iled information on variations in sea ice amics and ice morphology on a time scale rang-from several days to seasons. Because of the lap of the ERTS-1 obits over the study area, gnizable ice floes could be tracked on repeti-daily images for time periods as long as 6 days. rmation on ice drift velocities, compactness, size, fast ice and ice melt patterns, and dates reakup and freezeup were obtained. Although ils ofthe ice motion were complex, it was ible to delineate some general patterns such as dvection of ice southward through the islands he archipelago toward Viscount Melville d eastward out of Lancaster Sound, and ward out of Amundsen Gulf. Ice drift veloci-of greater than 58 km/day were measured in Ann Strait while values of 20 to 30 km/day common in Amundson Gulf. (Woodard-S)
-04412

2D. Evaporation and Transpiration

DRAWDOWN SOLUTIONS FOR SIMULTANEOUS DRAINAGE AND ET,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W76-04103

EVAPORATION FROM CATCHMENTS,
Commonwealth Scientific and Industrial Research Organization, Mordialloc (Australia). Div. of Atmospheric Physics.
E. K. Webb.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 203-236, 4 fig, 146 refs.

Descriptors: *Reviews, *Evaporation, Estimating equations, Measuring, Watersheds(Basins), Vegetation effects, Canopy, Heat budget, Water vapur, Mass transfer.

Of the methods available for estimating or measuring evaporation, three are selected as being likely to have relevance in catchment prediction studies: the bulk aerodynamics formula, the heat budget technique, and the combination approach. The basic methods are described, with their refinements and complications in dealing with the vegetative canopy and spatial variations in the surface. Their possible application in catchment studies is discussed, with prospects for future developments. (See also W76-04128) (CSIRO)
W76-04137

FURTHER CLIMATOLOGICAL STUDIES OF BAFFIN ISLAND, NORTHWEST TERRITORIES,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2B.
W76-04259

2E. Streamflow and Runoff

NAVIGATION CHENNEL IMPROVEMENT AT BONNEVILLE DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04109

HIGH VELOCITY CHANNEL, SOUTH FORK COEUR D'ALENE RIVER AT WALLACE, IDAHO.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04119

MODEL STUDY OF THE BONNEVILLE NAVIGATION CHANNEL, BONNEVILLE, OREGON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04122

PREDICTION IN CATCHMENT HYDROLOGY.
Australian Academy of Science, Camberra.
For primary bibliographic entry see Field 2A.
W76-04128

OVERLAND FLOW,
Melbourne and Metropolitan Board of Works Melbourne (Australia).
K. J. Langford.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 127-147. 4 fig, 2 tab, 44 ref.

Descriptors: *Reviews, *Overland flow, Mathematical studies, Surface runoff, Hydraulic models, Soil surfaces.
Identifiers: *Kinematic wave theory.

The current state of knowledge of overland flow, considered as flow generated by rainfall moving over the ground surface, is reviewed. The mathematical theory is presented, with particular reference to kinematic wave theory and its development in application to the catchment situation. Experimental hydraulic studies are also discussed with emphasis on the effects of surface roughness and uneveness. Directions of future developments in the field are suggested. (See also W76-04128) (CSIRO)
W76-04134

STREAMFLOW IN CATCHMENT MODELLING,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
E. M. Laurenson.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 149-164. 1 tab, 21 ref.

Descriptors: *Reviews, *Streamflow, *Routing, *Model studies, Streamflow forecasting, Watersheds(Basins), Channel flow, Channel morphology, Rainfall-runoff relationships.

In a review of current knowledge, the physical nature of real streamflow is first described in relation to concentration and dispersal of flow, and the relationships between channel flow and the size and form of the channel. Methods of streamflow routing and its incorporation in catchment models are then discussed against this physical background, with emphasis on the need for, and effects of, simplifying assumptions. (See also W76-04128) (CSIRO)
W76-04135

USE OF PHYSICAL PROCESS MODELS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2A.
W76-04140

EMPIRICAL METHODS AND APPROXIMATIONS IN THE DETERMINATION OF CATCHMENT RESPONSE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 4A.
W76-04141

PREDICTIVE USE OF CATCHMENT OUTPUTS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-04145

TRENDS IN CATCHMENT MODELLING,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 2A.
W76-04147

SURFACE WATER DATA, BRITISH COLUMBIA 1974.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04150

REFERENCE INDEX - CANADA 1972 - HYDROMETRIC MAP SUPPLEMENT.
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04160

NIAGARA RIVER ACOUSTIC STREAMFLOW MEASUREMENT SYSTEM,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7B.
W76-04165

SURFACE WATER DATA, ALBERTA 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04168

SURFACE WATER DATA, ATLANTIC PROVINCES 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04169

SURFACE WATER DATA, SASKATCHEWAN 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04170

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO 1, REGRESSION OF MEAN ANNUAL FLOODS ON PHYSIOGRAPHIC PARAMETERS,
Environmental Protection Service, Vancouver (British Columbia). Pacific Region.
R. M. Leith.
Report Series No 40, 1975. 42 p, 2 fig, 6 tab, 4 ref, 6 append.

Descriptors: *Floods, *Streamflow, Statistical methods, *Regression analysis, Precipitation(Atmospheric), Climates, Hydrologic data, Equations, *Canada, *Regional analysis, Estimating, Forecasting.
Identifiers: *Regionalization, Physiographic parameters, Logarithmic equations, *British Columbia.

The mean annual flood has been regressed on certain physiographic parameters and climatological variables for 144 stations in seven regions of British Columbia. The prime objective was to examine regression as a rool for regionalization. If distinct regression equations could be producted for each region then regionalization would be considered effective and three results could be achieved: 1. a means of evaluating the present network, 2. identification of important physiographic parameters, 3. a means of estimating mean annual flood for ungauged basins. Distinct equations were developed. The best equations for Mean Annual Flood, M.A.F., for each region are listed. The equations were developed by backward elimination of variables and were tested by plotting residuals and with split samples. (Environment Canada)
W76-04180

SURFACE WATER DATA ATLANTIC PROVINCES 1974.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch.; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04248

SURFACE WATER DATA, YUKON AND THE NORTHWEST TERRITORIES 1974.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04249

SURFACE WATER DATA, MANITOBA 1974.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04250

SURFACE WATER DATA, ONTARIO 1974.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04256

CALCULATION OF FREE-SURFACE AERATED WATER FLOWS,
For primary bibliographic entry see Field 8B.
W76-04306

ANALYSIS AND SYNTHESIS OF FLOOD CONTROL MEASURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-04308

ANALYSIS OF DROUGHT CHARACTERISTICS BY THE THEORY OF RUNS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
P. Guerrero-Salazar, and V. Yevjevich.
Hydrology Papers, No 80, September 1975. 44 p, 25 fig, 20 tab, 63 ref.

Descriptors: *Droughts, *Stochastic processes, *Distribution, *Time series analysis, Analytical techniques, Synthetic hydrology, Probability, Regression analysis, Frequency, Statistics, Water shortage.
Identifiers: *Theory of runs, *Water deficits, Run length, Biveriate series.

Methodologies for analysis of droughts were presented for stationary and periodic-stochastic processes. Droughts were studied by means of the theory of runs. Distributions of the longest run-length and the largest run-sum in a series of a given length, and distributions of the run-length and the run-sum of infinite series for various cases of univeriate and bivariate series were investigated. Exact, approximate, or experimentally obtained expressions were presented for univariate and bivariate independent and dependent series. For bivariate series, combinations of serially independent and dependent, and mutually independent and dependent series were studied. When exact analytical solutions could not be obtained, the data generation method was used. Frequency distributions of various drought characteristics associated with the runs, obtained by the generation method for the bivariate case, were fitted by discrete or continuous probability distribution functions. Multiple regression analysis was used to obtain useful relationships between the parameters of fitted distribution functions and the parameters of time series dependence, cross dependence, and the truncation levels. Periodic-stochastic series were studied by defining drought and its parameters for this particular type of hydrologic processes. (Singh-ISWS)
W76-04310

FROM AEROSPACE PHOTOGRAPHS TO FORECASTING AND CALCULATING FLOWS,
For primary bibliographic entry see Field 7B.
W76-04325

RIVER RUN-OFF CONTROL,
For primary bibliographic entry see Field 4A.
W76-04326

FLOW-DURATION AND LOW-FLOW FREQUENCY DETERMINATIONS OF SELECTED ARKANSAS STREAMS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4A.
W76-04406

MAGNITUDE AND FREQUENCY OF FLOODS IN SMALL DRAINAGE BASINS IN NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 4A.
W76-04410

2F. Groundwater

RESPONSE TO TIDES OF COASTAL AQUIFERS: ANALOG SIMULATION VS. FIELD OBSERVATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
J. A. Williams, and T-C. Liu.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 47 $4.50 in paper copy, $2.25 in microfiche. Technical Report No 86, June 1975. 67 p, 18 fig, 6 tab, 35 ref, 3 append. OWRT A-020-HI(3). 14-31-0001-3511.

Descriptors: *Groundwater, *Tidal effects, Laboratories, *Aquifers, *Hawaii, *Porosity, *Water table, *Fourier analysis, Water level fluctuations, Pumping, *Analog models.
Identifiers: *Tidal fluctuations, *Coastal aquifers, Spectral analysis, Analog simulation.

A summary is presented of the work to date on the response to tides of coastal aquifers. In particular, presented are results of experiments performed to study the influence of an oscillating water table on storativity (i.e., effective porosity), the application of both harmonic and spectral analyses to water surface time histories measured in the field near Ewa Beach and in Honolulu Harbor, and an electric analog model designed to simulate the shallow coral-limestone aquifer at Ewa Beach, Oahu, Hawaii. Results indicate that the effective porosity for an oscillating water table will in general, depend on the frequency of the oscillation with

ndence being strong or weak as either or both
specific yield and the transmissivity are larger
smaller, respectively. The spectral analysis con-
ms that the semidiurnal power suffers a greater
enuation than the diurnal power. The technique
determining aquifer properties from tidal
ponse data is valid, but results will be less relia-
than those ascertained from pump test data.
e optimum results are those based on both tidal
a and pump test data, as one method serves as a
ck on the other.
6-04002

REVIEW AND SYNTHESIS OF THE BIOT D JACOB-COOPER THEORIES OF OUND-WATER MOTION,
vada Univ., Reno. Desert Research Inst.
. Cooley.
ailable from the National Technical Informa-
Service, Springfield, Va 22161 as PB-249 467,
0 in paper copy, $2.25 in micofiche. Center for
ter Resource Research, Hydrology and Water
ources Publication, No 25, October 1975. 87 p,
g, 41 ref, 2 append. OWRT A-058-NEV(1). 14-
001-5028.

criptors: *Aquifer characteristics, oundwater movement, Land subsidence, ess analysis, Uncolsolidated aquifers, Rock perties, Mechanical properties, Strain, oretical analysis, Flow, Porous media, iews, Equations.
tifiers: Biot theory, Jacob-Cooper theory.

Biot theory of flow in elastic media was found e capable of describing general problems in- ing unsteady-state ground-water motion. Non- arity of the stress-strain relations, finite strain, otropy and heterogeneity of the porous medi- and general boundary conditions are all con- d in the theory. Because the stress-strain rela- s were all obtained from free energy expres- s, anelastic problems can be analyzed by ap- imations of the types often used in soil hanics and other fields of solid mechanics. combined fluid/solid mass continuity equation en using material coordinates has the same as the equation in deforming coordinates ed in 1966 by Cooper. The processes of me averaging of the fluid and solid momentum ervation equations revealted that decomposi- of total stress into stress in the solids plus a pressure term is obtained from consideration e surface traction boundary condition at the /solid interface. Volume averaging of the mo- um conservation equations, mass conserva- equations for both the fluid and the solids, and ree energy expressions also demonstrated the e of the erros involved in the transformation point forms to averaged forms of the equa- . Future hydrogeological research involving Biot theories and variants would profitably der (a) determination of the conditions under n an equation of the Jacob form is a good ap- mation, (b) development of suitable approxi- n for the case where it is not and (c) formula- f field methods for obtaining the necessary neters involved in the approximations. n-Nevada)
04003

OGEN MOVEMENT IN A SHALLOW FER SYSTEM OF THE NORTH OLINA COASTAL PLAIN,
onservation Service, Raleigh, N. C.
imary bibliographic entry see Field 5B.
04099

HICAL CALCULATION OF AQUIFER SMISSIVITIES IN NORTHERN CATER- , NEW ZEALAND,
bury Univ., Christchurch (New Zealand). of Civil Engineering.
Hunt, and D. D. Wilson.
l of Hydrology (New Zealand), Vol 13, No -80, 1974. 8 fig, 7 ref.

Descriptors: *Transmissivity, *Graphical methods, *Groundwater, *Steady flow, Surface-groundwater relationships, Recharge, Aquifer testing, Specific capacity, Flow, Unconsolidated aquifers, Glacial aquifers, Graphical analysis, Aquifer characteristics, Aquifers, Aquifer systems, Water levels, Piezometry.
Identifiers: Groundwater management, *New Zealand, *Canterbury Plains(New Zealand).

A graphical technique was used to determine transmissivities and steady-state flow rates for groundwater flow in northern Canterbury. The results of the analysis appear to be in reasonable agreement with what is known about the geology and geological history of the region. Maximum well yields, obtained from drillers' records, also tend to support the final results. Hence, it was suggested that this technique might be useful as a tool in the analysis and management of groundwater aquifers in other parts of New Zealand. (Sanderson-ISWS)
W76-04102

MOVEMENT OF SOIL AND SHALLOW GROUNDWATER,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Land Research Management.
For primary bibliographic entry see Field 2G.
W76-04133

PROGRAM FRONT, TWO - DIMENSIONAL SIMULATION OF A MOVING INTRUSION FRONT IN A THIN HORIZONTAL CONFINED AQUIFER,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04172

PROGRAM TEBES, TRANSMISSIVITY, LEAKAGE FACTOR AND STORATIVITY FROM A LEAST SQUARES FIT OF RESIDUAL DRAWDOWN,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04181

THE EFFECT OF CLIMATE ON THE CHEMISTRY OF CARBONATE GROUNDWATER,
McGill Univ., Montreal (Quebec). Dept. of Geography.
J. J. Drake, and T. M. L. Wigley.
Water Resources Research, Vol 11, No 6, p 958-962, December 1975. 1 fig, 35 ref.

Descriptors: *Geochemistry, *Carbon dioxide, *Carbonates, *Aquifer characteristics, *Climates, *Model studies, Temperature, Chemistry, Carbonate rocks, Dolomite, Limestones, Calcite, Bicarbonates, Groundwater, Soil water, Soil chemistry, Water chemistry, Water quality, Subsurface waters, Erosion rates, North America.
Identifiers: Climatic effects, *Groundwater chemistry, Carbonate groundwater chemistry, CO2-temperature relationship, Carbonic acid.

The temperature coefficient of the log P sub CO2-temperature relationship for springwater from carbonate terrains in North American is approximately 0.07/C. Consideration of a simple model of soil air behavior and various published data suggested that the temperature coefficient of the same relationship for soil air is of the order of 0.04/C. A model where the soil zone is the source of carbon dioxide for water entering a groundwater system and where the subsequent chemical evolution of the water occurs under closed system conditions was consistent with these relationships. (Henley-ISWS)
W76-04297

REGIONAL HYDROCHEMISTRY OF NORTH AMERICAN CARBONATE TERRAINS,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 2K.
W76-04298

GROUND WATER LAW: PROBLEM AREAS,
Arizona Univ., Tucson. Coll of Law.
For primary bibliographic entry see Field 4B.
W76-04334

WATER-LEVEL RECORDS FOR COLORADO, 1971-75,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-04394

INTERPRETATION OF GEOLOGIC AND HYDROLOGIC DATA FROM THE RAY-1 WELL, CITY OF GALLUP, MCKINLEY COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W76-04396

POTENTIOMETRIC SURFACE AND AREAS OF ARTESIAN FLOW OF THE FLORIDIAN AQUIFER IN FLORIDA, MAY 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-04405

COCKEYSVILLE QUADRANGLE: GEOLOGY, HYDROLOGY AND MINERAL RESOURCES,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 7C.
W76-04407

GROUND-WATER RESOURCES OF WAUKESHA COUNTY, WISCONSIN,
Geological Survey, Portland, Oreg.
J. B. Gonthier.
Wisconsin Geological and Natural History Survey, Madison, Information Circular Number 29, October 1975. 47 p, 20 fig, 1 plate, 5 tab, 34 ref.

Descriptors: *Groundwater resources, *Hydrologic data, *Water yield, *Water quality, *Wisconsin, Hydrogeology, Aquifer characteristics, Water wells, Pumping, Water utilization, Water supply, Groundwater recharge, Chemical analysis.
Identifiers: Waukesha County(Wis).

Good-quality water is available from the sand-and-gravel, Niagara, and sandstone aquifers in Waukesha County, Wis. As much as 15 gpm can be obtained from wells almost everywhere in the county. Several hundred gpm are available from aquifers in the glacial drift that fill bedrock valleys to thicknesses of 300 ft or more. Estimated well yields from much of the surficial outwash in western Waukesha County exceed 500 gpm. Estimated well yields from most of the Niagara aquifer, a dolomite as much as 325 ft thick in the eastern two-thirds of the county, exceed 50 gpm. The sandstone aquifer underlies the entire county and ranges in thickness from about 400 ft in the northwest corner to about 2,400 ft in the southeast corner. This aquifer yields more than 1,000 gpm to wells over most of the county and is the principal source for municipal and subdivision water. Groundwater in the County is suitable for most uses. Most of the water is a calcium magnesium bicarbonate type, is very hard (more than 180 mg/litre), and requires softening for some uses.

About 24.3 mgd of groundwater was pumped in the county in 1970. Sixty-two percent was withdrawn from the sandstones aquifer. More than one-half of the latter amount was for domestic use, and more than one-third was for industrial and commercial uses. (Woodard-USGS)
W76-04408

DIGITAL MODEL SIMULATION OF THE GLACIAL-OUTWASH AQUIFER AT DAYTON, OHIO.
Geological Survey, Columbus, Ohio.
R. E. Fidler.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-247 997, $4.00 in paper copy, $2.25 in microfiche. Water-Resources Investigations 18-75, September 1975. 25 p, 9 fig, 12 ref. Prepared in cooperation with the Miami Conservancy District.

Descriptors: *Groundwater resources, *Model studies, *Aquifers, *Hydrogeology, *Ohio, Hydraulic properties, Water yield, Induced infiltration, Groundwater recharge, Water supply, Water demand, Evaluation, Aquifer characteristics, *Computer models.
Identifiers: Dayton(Ohio), *Great Miami River Valley(Ohio), Glacial-outwash aquifer.

Dayton, Ohio, and its environs obtain most of their water from wells which penetrate highly productive glacial-outwash deposits underlying the Great Miami River and its tributaries and receive recharge from induced leakage. Combined municipal and industrial use of groundwater in the 90 sq mi area has increased from about 180 cfs in 1960 to nearly 250 cfs in 1972. The increased pumpage has resulted in continuing water-level declines in some areas. A digital model, which uses a finite-difference approximation technique to solve partial differential equations of flow through a porous medium, was used to evaluate the effects of pumping stresses on water levels. The simulated head values presented in map form generally are in good agreement with potentiometric-surface maps prepared from field measurements. (Woodard-USGS)
W76-04409

2G. Water In Soils

SOIL WATER REPELLENCY AND THE USE OF NONIONIC SURFACTANTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
J. Letey, J. F. Osborn, and N. Valoras.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 472, $5.00 in paper copy, $2.25 in microfiche. California Water Resources Center, Contribution 154, Completion Report, December, 1975. 85 p, 47 fig, 19 tab, 33 ref. (California Water Resources Center Project UCAL-WRC-W-332). OWRT B-141-CAL(9). 14-31-0001-3562.

Descriptors: Soil water, *Surfactants, *Wettability, *Surface tension, Penetration, *Soil water movement, *Infiltration, Adsorption, Soil profiles, *Moisture content.
Identifiers: Nonionic surfactants, *Soil water repellency.

Research was conducted (1) to determine factors causing soil water repellency, (2) to characterize and measure soil water repellency magnitude, and (3) to determine the effect of soil water repellency on various soil-water flow processes. A number of factors are involved in the formation of soil water repellency, but presence of plant litter and a soil relatively high in sand content appear to be the most important factors. High temperatures, such as those associated with fire, intensify the degree of soil water repellency. Soil water repellency can be characterized by the liquid-solid contact angle, solid-air surface tension, water drop penetration time, 90 degree surface tension, and a water repellency index. Addition of nonionic surfactants to water allows for a higher infiltration rate in a water repellent soil, but it has either negligible or negative effects when applied to a wettable soil. Application of nonionic surfactants to water repellent soils improves their rewet properties. Surfactants are adopted by soil which complicates the theoretical prediction of their effect on water infiltration. Different surfactants have different adsorption characteristics which influence theie effectiveness and mobility in a soil profile. (Snyder-Calif, Davis)
W76-04001

SOIL COMPACTION DUE TO HARVEST TRAFFIC IN SUGARCANE FIELDS ON A LAJAS VALLEY FARM OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Agricultural experiment Station.
For primary bibliographic entry see Field 3F.
W76-04089

ORIENTATION OF CLAY PARTICLES AS IT RELATES TO CRUSTING OF SOIL,
Montana Agricultural Experiment Station, Bozeman, and Montana State Univ., Bozeman. Dept. of Chemistry.
D. M. Ferry, and R. A. Olsen.
Soil Science, Vol. 120, No. 5, p 367-375, November 1975. 6 fig, 2 tab, 17 ref.

Descriptors: *Clay minerals, *Soil structure, *Montana, Soil aggregates, Soil physical properties, Organic matter, Soil compaction, Compressive strength, Turbidity, Rupturing, Shrinkage, Bulk density, Hydraulic conductivity, Permeability, Equipment, Soil strength, Electrolytes, Soil water, Model studies.
Identifiers: *Orientation, *Soil crusting, Pylon soil, Briquettes, Oxygen permeability, Thin sections, Partial pressure, Friability, Coulombic attraction.

A simple model for a soil crust was formulated and experimentally tested. It was based upon the parallel orientation and close packing of clay particles perhaps like that in shale. The physical and chemical factors which disrupt the ordered arrangement of the plate-shaped particles were noted to be those which induce aggregate formation and which result in good soil structure. The factors which induce greater orientation and packing were noted to be those which induce crust formation and poor soil structure. The resultant deleterious effects upon seedling germination, moisture penetration and runoff, aeration, and penetrability to roots are well known. Experimental attempts were made to test the validity of the proposed model. In each instance, the data either provided support for the model or else could be reasonably reconciled with the model. The model appeared to provide a reasonable basis for explaining cultural practices which are known to influence soil structure in either beneficial or deleterious ways. (Visocky-ISWS)
W76-04097

UNSATURATED FLOW MECHANISMS IN LOW-SWELLING CLAYS,
Cementation Research Ltd., Rickmansworth (England).
H. Y. Wong, and R. N. Yong.
Soil Science, Vol. 120, No. 5, p 339-348, November 1975. 5 fig, 4 tab, 15 ref.

Descriptors: *Unsaturated flow, *Clays, *Kaolinite, *Soil properties, Bulk density, Temperature, Moisture content, Wetting, Soil moisture, Laboratory tests, Saturation, Pores, Infiltration, Soil water movement, Capillary action, Statistical models, Hydraulic conductivity.
Identifiers: Low-swelling clays, Inlet suction, Wetting front, English clay, Peerless clay, Moisture profile, Intrinsic penetrability.

The unsaturated flow mechanisms in low-swell clays were evaluated by studying the effects of bulk density, temperature, initial water conte and inlet suction on such unsaturated flow aspe as wetting front advance and soil moisture prof The soil moisture profiles were plotted in a dim sionless form, and a statistical approach adopted to give a more quantitative comparison general, the effects of the internal forces of teraction and hence the swelling potential were appreciable. This was well supported by the lir relationship between wetting front advance square root of time under practically all tes conditions, thus indicating a stable pore geom during the flow process. In most cases a sin capillary model based upon the initial pore st ture seemed to be able to explain most of the served phenomena. However, the change in shape of the soil moisture profiles with change initial water content and inlet suction still ca be fully accounted for. (Visocky-ISWS)
W76-04098

INFILTRATION OF WATER INTO SOIL,
Commonwealth Sceintific and Industrial Rese Organization, Canberra (Australia). Div. of L Use Research.
P. M. Fleming, and D. E. Smiles.
In: Prediction in Catchment Hydrology. Austr Academy of Science, Canberra, Australia, 19 83-110. 5 fig, 90 ref.

Descriptors: *Reviews, *Infiltration, *Equati *Model studies, Soil water movement, Po media, Expansive soils, Soil physical proper Computer models, Watersheds(Basins).

A basic statement of the existing physical th of infiltration is presented in terms of a flow e tion developed for uniform, non-swelling po media, with modifications appropriate to s fiedand swelling soils. Various empirical equa derived from hydrological studies are the terpreted in relation to this theory, with som tention to the influence of spatial variatio biological and soil properties. The implicatio all these considerations for modelling infiltr in computer models of catchment processes discussed. (See also W76-04128) (CSIRO)
W76-04132

MOVEMENT OF SOIL AND SHALL GROUNDWATER,
Commonwealth Scientific and Industrial Rese Organization, Wembley (Australia). Div. of Research Management.
A. J. Peck, and M. B. Iversen.
In: Prediction in Catchment Hydrology. Austr Academy of Science, Canberra, Australia, 19 111-125. 1 fig, 73 ref.

Descriptors: *Reviews, *Mathematical stu *Soil water movement, *Subsurface ru *Model studies, Rainfall-runoff relations Groundwater movement, Base flow, Sur groundwater relationships, Water loss, Eva tion, Transpiration, Watersheds(Basins), Un rated flow.

After infiltration, soil water is redistributed w the soil, and lost by evaporation, transpiratio seepage. Study of these processes is compli by severe non-linearity and hysteresis phenon but they can be represented mathematically equations solved numerically to describe satu and unsaturated flow in a relatively uniform s review of such studies is presented, and the tribution of interflow and baseflow to strean is discussed. General aspects of the problem soil water phase of catchment modelling reviewed; a major difficulty is the represen of spatial variation in soil properties. (See W76-04128) (CSIRO)
W76-04133

FECT OF EFFLUENT FROM BEEF EDLOTS ON THE PHYSICAL AND CHEMI-L PROPERTIES OF SOIL,
braska Univ. Lincoln Dept. of Agronomy.
primary bibliographic entry see Field 5B.
6-04289

PERIMENTAL INVESTIGATION OF THE FUSIVITY COEFFICIENT,
vain Univ. (Belgium). Department de Genie al.
aroussi, G. Vandervoorde, and L. DeBacker.
Science, Vol 120, No 4, p 249-255, October 5. 8 fig, 7 ref.

criptors: *Diffusion, *Diffusivity, *Porous ia, *Moisture content, Soil physics, Unsatu-d flow, Laboratory tests, Analysis, Saturation, er, Water vapor, Mathematical studies.
tifiers: *Two phase flow, *Diffusivity coeffi-t, Unsaturated soils.

dependency of the diffusivity coefficient on luid content of an unsaturated porous medium approached experimentally. The diffusivity ficient was measured at different water con-in horizontal columns of glass beads. Analy-f the method of measurement of the diffusivi-oefficient showed that simple relationships een the diffusivity coefficient and the water ent were obtained within well-defined ranges ater content. The phenomena occurring in the ange of water contents seemed basically dif-nt from those in the wet range. (Adams-ISWS) -04305

TING THE EARTH,
dwatch Inst., Washington, D.C.
primary bibliographic entry see Field 3C.
-04352

ORADO REGULATIONS FOR EFFLUENT ITATIONS; TREATMENT WORKS SITE ROVAL REGULATION; STORM SEWER HARGE REGULATIONS.
rado Water Quality Control Commission, er.
975 BNA Environmental Rep. 726: 1141-42 . Water Qual. Control Comm'n Regs. for Ef-t Limitations 1975).

riptors: *Sewerage, *Colorado, *Water quali-ndards, *Waste water disposal, *Water quali-ntrol, Permits, Suspended solids, Water pol-, Law enforcement, Chlorine, Oil, Hydrogen concentration, Sampling, Analytical iques, Sewage treatment, Water treatment, ents, Waste water disposal.
ifiers: *Fecal count limits.

hance the quality of Colorado water, the Quality Control Commission has promul-standards to regulate the discharge of ef-s into state waters. Apart from a few statuto-emptions, these standards are applicable to aste water discharges. The implementing tion does provide, however, that these stan-are not immediately applicable if the rge obtains a permit containing a schedule will bring the discharge into compliance he standards within a specified time. These rds are also not applicable if the Commis-as otherwise promulgated specific standards specific industry. The standards when they plicable, pertain to several different aspects te water including; BOD limits; suspended limits; fecal coliform count limits; residual e limits; pH limits; and oil and grease limits. gulation further specifies whether grab sam-composite samples will be used in measur-mpliance, and several references are sug-to the discharger when he is devising cal methods to assure compliance. The ion also provides that a sewage treatment which is defined as a facility having a capacity to receive 2,000 gallons of discharge per day, may not be constructed unless a site approval and permit have been obtained from the Commission. (Hoffman-Florida)
W76-04375

2H. Lakes

UPTAKE AND DISTRIBUTION OF TRACE METALS IN FISH,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W76-04010

THE EFFECT OF THE GOSHEN BAY DIKE ON THE BENTHOS OF UTAH LAKE IN RELATION TO WATER QUALITY,
Brigham Young Univ., Provo, Utah. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-04013

OXIDATION OF LAKE AND IMPOUNDMENT HYPOLIMNIA,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W76-04016

VERTICAL EDDY DIFFUSION STUDIES IN THE THERMOCLINE OF A SMALL STRATIFIED LAKE,
For primary bibliographic entry see Field 5B.
W76-04082

PHYSICAL AND CHEMICAL CHARACTERISTICS OF GREAT BEAR LAKE, NORTHWEST TERRITORIES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
L. Johnson.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 11, p 1971-1987, November 1975. 7 fig, 4 tab, 67 ref.

Descriptors: *Lakes, *Physical properties, Biological properties, *Chemical properties, *Lake morphometry, *Limnology, *Dissolved oxygen, *Oligotrophy, *Canada, Water circulation, Mixing, Water chemistry, Water temperature, Bathymetry, Nutrients, Productivity, Seasonal, On-site investigations, Polar regions.
Identifiers: Great Bear Lake(Northwest Territories), Polar(Arctic) Lakes, Seasonal temperature-depth profiles, *Seasonal oxygen-depth profiles.

Great Bear Lake, a large, deep lake in a northern temperate setting, was the subject of a series of investigative sessions during the summers of 1963-1965. Sounding transects, temperature tests, and chemical analyses of water samples were performed to provide information on the limnology, biology, and bathymetry of the lake. Great Bear Lake consists of two distinct basins with a combined volume of 2235.7 cu km and a shoreline of 2719 km. The main basin waters are remarkably clear and uniform in chemistry, irrespective of location or depth. Oxygen content is near saturation level at all depths throughout the year, with supersaturation in surface waters in summer and beneath ice in winter. There is generally a single period of circulation at a temperature near 4 C in summer. Great Bear Lake thus shows the characteristics of a polar monomictic lake and is much mor oligotrophic than nearby lakes, which exhibit temperate dimictic character. This was attributed to low nutrient status and resultant low biological activity, free circulation in the main basin, and large volume of the lake. (Bender-ISWS)
W76-04095

INVENTORY OF CANADAIN FRESHWATER LAKES.
Department of the Environment, Ottawa (Ontario). Inland Waters Directories; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W76-04153

CANADA CENTRE FOR INLAND WATERS - 1973.
Canada Centre for Inland Waters, Burlington (Ontario).
1974, 173 p, 112 fig, 15 tab, 385 ref, 3 append.

Descriptors: *Great Lakes, *Research and development, Studies, *Projects, Beach erosion, Flooding, Properties, Damages, Hydrography, Surveys, Data storage and retrieval, Computer programs, Conferences, Oil spills, Annual, Water levels, Fisheries, *Canada.
Identifiers: *Great Lakes Water Quality Agreement, High water, Toxicity substance research, Hydraulic laboratory development.

Activities of the Canada Centre for Inland Waters, during the year 1973, are outlined. Highlights of these activities include the implementation of the Great Lakes Water Quality Agreement, the Canada-Ontario Agreement on Great Lakes water quality, efforts to curb high water on the Great Lakes and related shore erosion and property damage problems, hydrographic surveys in the Arctic, further research on environmental contaminations, oil spill studies, data aquisition systems, and research reports and conferences. (Environment Canada)
W76-04155

EFFECTS OF ICE AND SNOW COVER ON TRANSMISSION OF LIGHT IN LAKES,
Department of the Environment, Burlington (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W76-04179

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRIAN SHIELD LAKES OF NORTHWESTERN ONTARIO,
For primary bibliographic entry see Field 5A.
W76-04193

GAS-EXCHANGE RATES IN A MALL LAKE AS DETERMINED BY THE RADON METHOD,
For primary bibliographic entry see Field 5B.
W76-04219

AN IN-SITU STUDY OF THE SUTRITION OF LAKE ZOOPLANKTON USING CARBON 14 AND PHOSPHOROUS 32, FLATHEAD LAKE, MONTANA,
Montana Univ., Missoula.
For primary bibliographic entry see Field 5C.
W76-04231

PLANKTON MICRO-FOSSILS AS INDICATORS OF PALEOTROPHIC DYNAMISM IN FLATHEAD LAKE,
Montana Univ., Missoula.
For primary bibliographic entry see Field 5C.
W76-04235

CANADA CENTRE FOR INLAND WATERS, 1974.
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5G.
W76-04258

THE RESONANT INSTABILITIES OF LONG WAVES OBLIQUELY INCIDENT ON A BEACH,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-04300

AUSTRALIA DAMS AND STORAGES.
Department of Minerals and Energy, Canberra (Australia). Div. of National Mapping.
For primary bibliographic entry see Field 7C.
W76-04307

BIOLOGICAL AND WATER QUALITY EFFECTS OF ARTIFICIAL DESTRATIFICATION OF LAKE OF THE ARBUCKLES,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-04385

CIVIL WORKS PROJECTS: LAKESHORE MANAGEMENT.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-04450

2I. Water In Plants

FOOD, FEEDING, AND CONDITION OF LOBSTERS, HOMARUS AMERICANUS, THROUGHOUT THE SEASONAL CYCLE IN BONAVISTA BAY, NEWFOUNDLAND,
Fisheries and Marine Services, St. John's (Newfoundland). Biological Station.
G. P. Ennis.
J Fish Res Board Can, 30(i2 Part 1): 1905-1909, Illus, 1973.

Descriptors: *Lobsters, *Canada, Seasonal, Bays, Crabs, *Food chains, Invertebrates, Mollusks, Fish.
Identifiers: *Bonavista Bay(Newfoundland), Hyas-araneus, Sea-stars, Strongylocentrotus-drobachiensis, *Lobster molting.

The rock crab, Cancer irroratus and spider carb, Hyas araneus, made up about 50% of the food of lobsters in Bonavista Bay, Newfoundland (Canada). The sea urchin, Strongylocentrotus drobachiensis, several species of mollusks and several species of sea stars made up 7.1, 10.9 and 10%, respectively. The remainder was mainly a variety of bottom invertebrates but fish and seaweeds were also fairly common. There was a change to a slightly more calcium-rich diet during the molting season. A rapid increase in feeding activity during the summer coincided with increasing temperatures, but despite decreasing temperatures during the fall, feeding activity remained high. The feeding index for females remained high longer into the winter than for males. Physiological condition was directly related to the molting cycle. Premolt condition was very high, postmolt very low, and recovery to the intermolt condition was attained about 2 1/2 mo. afterthe peak molting period.--Copyright 1974, Biological Abstracts, Inc.
W76-04017

THE INTERCEPTION PROCESS,
G. J. Blake.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 59-81, 3 fig, 5 tab, 39 ref.

Descriptors: *Reviews, *Interception, *Vegetation effects, *Model studies, Throughfall, Stemflow, Estimating, Measurement, Watersheds(Basins), Water balance, Evaporation, Antecedent moisture content, Rainfall intensity.
Identifiers: *New Zealand.

A review of methods and results of studies of the process of interception is presented, with emphasis on its response to meteorological and vegetative characteristics. Precipitation intensity and duration, antecedent moisture conditions, evaporative effects and characteristics of the intercepting surface (with an illustrative survey of vegetation types in New Zealand) are considered. Methods of modelling to take account of interception in conceptual studies of the catchment water balance are discussed. Some recommendations for the future direction of research are indicated. (See also W76-04128) (CSIRO)
W76-04131

VIABILITY OF ALGAE IN THE DIGESTIVE TRACTS OF TWO CYPRINODONTIDS,
Oklahoma Univ., Norman. Biological Station.
J. R. Rabe, A. A. Echelle, and H. E. Schlichting, Jr.
Prog Fish-Cult. 35(3): 147-149. 1973.

Descriptors: *Algae, Cyanophyta, Chlorophyta, Diatoms, *Killifishes, *Fish food organisms.
Identifiers: Cyprinodon-Rubrofluviatilis, *Cyprinodontids, Digestive tracts(Killifishes), Fundulus-Zebrinus.

Algae (green, bluegreen, and diatoms) occurred in 100% of the Cyprinodon rubrofluvia and Fundulus zebrinus that were examined. A total of 30 genera were cultured from the guts. There was no notable difference in floras of fore- and hindguts. Green and bluegreen algae seem to be indigestible, but evidence suggests that significant nutriment may be derived from diatoms.--Copyright 1974, Biological Abstracts, Inc.
W76-04149

DEVELOPMENT, GROWTH, AND RELATIONSHIP BETWEEN TEMPERATURE AND METAMORPHOSIS RATE OF THE EARLIER LARVAE ON MACROBRACHIUM ROSENBERGI (DE MAAN), (IN KOREAN),
Tokyo Univ. (Japan). Dept. of Fisheries.
C. S. Kwon.
Bull Korean Fish Soc. 7(2): 52-62. 1974.

Descriptors: *Growth rates, Growth stages, *Larval growth stage, Temperature, Brackish water, Rivers, *Temperature.
Identifiers: Artemia-Salina, Macrobrachium-Rosenbergi, *Metamorphosis rate, *Prawns, Indo-Pacific region.

The freshwater prawn, M. rosenbergi (De Maan) is a very common species in the Indo-Pacific region, inhabiting both fresh and brackfish waters in lowland areas. It is especially abundant in the lower reaches of rivers influenced by seawater. It is one of the largest commercial species of Macrobrachium. The larval development, growth, optimum temperature and metamorphosis rate up to the 1st post-larvae were studied under the following conditions: salinity, 6.58-7.05% Cl; pH, 8.0-8.2; rate of flow, 0.3 1/min and illumination, 3000 lux. Temperature ranged from 27.5-28.7C during early larval development. Food used for larvae was Artemia salina nauplii in filter-circulation aquaria.--Copyright 1975, Biological Abstracts, Inc.
W76-04208

WATER TRANSPORT THROUGH PLANT TISSUES IN THE PRESENCE OF A DIFFUSABLE SOLUTE,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. J. Molz, and G. M. Hornberger.
Soil Sci Soc Am Proc. 37(6): Illus. 1973.

Descriptors: *Plant tissues, Solutes, Aqueous solutions, *Soil-water-plant relationships.
Identifiers: *Crank-Nicolson method, *Plant cells.

Because water transport through soils and p
are closely related and interdepe
phenomena, it is logical to attempt to deve
quantitative description of water flow in the
portion of the soil-plant-atmosphere conti
comparable to that which exists for the soi
tion. The theory of nonequilibrium thermody
ics is used to develop a quantitative descripti
water transport through aggregations of plan
containing both permeating and nonperm
solutes in aqueous solution. Application o
theory results in 2 linear, coupled, partia
ferential equations with a water potential-r
term and the diffusable solute concentration
pendent variables. As the permeability of th
fusable solute approaches zero, the syste
equations reduces to a single equation first d
by Phillip, wherein the dependent variable is
potential. Using the Crank-Nicolson method
dimensional forms of the equations are solv
merically for the case of a fully turgid
placed in a solution of time zero. The so
shows that the resulting transport process
tirely different from the classical case in whi
cell membranes are permeable to water
Copyright 1974, Biological Abstracts, Inc.
W76-04243

RETENTION OF FLUORESCENT PIGME
COHO SALMON AFTER TWO YEARS,
Washington State Dept. of Fisheries, Olymp
D. E. Phinney, and S. B. Mathews.
Prog Fish-Cult. Vol 35, No 3, p 161-163, 197

Descriptors: Salmon, *Pigments, Fluores
*Marking techniques, Growth stages.
Identifiers: *Coho salmon, *Fluorescent pig

A method of mass-marking fish that has b
popular in recent years is the applicat
fluorescent pigment by compressed air. Th
gevity of the mark is not well defined, ho
the longest period marked fish have been h
mo. As part of a larger experiment, coho
(Oncorhynchus kisutch) were marked at age
either red, yellow, or green pigment. After 2
relatively natural environment, marks had
somewhat but were readily discernible. A
growth in length was about 160 mm.--Co
1974, Biological Abstracts, Inc.
W76-04332

VULNERABILITY OF CHANNEL CATFI
LARGEMOUTH BASS PREDATION,
Southern Illinois Univ., Carbondale. Fi
Research Lab.
Jerry T. Krummrich, and Roy C. Heidinger.
Prog Fish-Cult, 35(3): 173-175, 1973, (In Eng

Descriptors: *Channel catfish, *Bass, *Pre
Prey fish.

Various sizes of channel catfish (Ictalurus
tatus) were stocked in ponds containing 2
gemouth bass (Micropterus salmoides). C
catfish 2-6 in. in length were vulnerable
predation, whereas 8-in. channel catfish w
eaten. Two-lb largemouth bass held in aqu
consumed catfish up to 7 in. in fork length.
right 1974, Biological Abstracts, Inc.
W76-04401

A TECHNIQUE FOR FISH POPULATION
PLING IN DENSE SUBMERSED VEGETA
Florida State Game Fresh Water Fish C
sion, Ocala.
B. S. Barnett.
Prog Fish-Cult, 35(3): 181-182, Illus, 1973.

Descriptors: *Fish populations, *Sa
*Submerged plants, *Nets.

A technique was devised for quantitati
population sampling in dense growths
mersed aquatic plants using a miniature m

n of the 4-sided block-off net. The net was con-
ıicted of fiberglass screen material and was
ıigned to encompass an area of 100 sq ft. The
ximum sampling depth was 3 1/2 ft. Fishes were
overed following removal of all vegetation
hin the sample area. This technique is not effec-
for large fishes which may be numerous
und the periphery of dense vegetation, but it is
ıly effective for sampling within the plant beds
ch contain a large number and biomass of
ge and juvenile game fishes.--Copyright 1974,
logical Abstracts, Inc.
5-04402

Erosion and Sedimentation

**ALYSIS OF THE SEDIMENT FILTERING
ION OF GRASSED MEDIA,**
tucky Water Resources Research Inst., Lex-
on.
primary bibliographic entry see Field 4D.
-04009

**ROLOGIC DATA SUMMARY: CLEAR-
ER RIVER BASIN, WATER YEAR 1973-**
,
hington Univ., Seattle. Coll. of Forest
urces.
primary bibliographic entry see Field 4C.
-04019

**VY METAL POLLUTION IN THE SEDI-
TS OF THE COEUR D'ALENE RIVER
TA,**
Univ., Moscow. Dept. of Chemistry.
rimary bibliographic entry see Field 5A.
04091

NSPORT OF MATERIALS IN STREAMS,
ourne Univ., Parkville (Australia). Dept. of
Engineering.
Lawson, and I. C. O'Neill.
ediction in Catchment Hydrology. Australian
emy of Science, Canberra, Australia, 1975. p
02, 9 fig, 1 tab, 97 ref.

iptors: *Reviews, *Soil erosion, *Sediment
ort, *Model studies, Forecasting, Sediment
Sediment yield, Stream erosion, Alluvial
els, Channel flow, Watersheds(Basins).

ıysical theory of streamflow in alluvial chan-
nd of the transport of sediment in streams is
ted and discussed, with emphasis on the
tion of sediment loads. Considerations af-
the incorporation of soil erosion and sedi-
transport into catchment models are out-
and several examples of such models are
ed and compared. (See also W76-04128)
O)
4136

IENT DATA - CANADIAN RIVERS 1971.
ment of the Environment, Ottawa
o). Water Resources Branch; and Depart-
f the Environment, Ottawa (Ontario). Ap-
ydrology Div.; and Department of the En-
ent, Ottawa (Ontario). Inland Waters
rate.
mary bibliographic entry see Field 7C.
251

**OD AND APPARATUS FOR MEASURING
SEDIMENTATION INFILTRATION
OW,**
nary bibliographic entry see Field 5A.
275

**CONTENTS OF LAKE SEDIMENT
FROM ESTABLISHED MINING
AREAS: AN INTERFACE OF EXPLORATION AND ENVIRONMENTAL GEOCHEMISTRY,**
Geological Survey of Canada Ottawa, (Ontario). Resource Geophysics and Geochemistry Div.
For primary bibliographic entry see Field 5B.
W76-04291

DISPERSION OF MASS IN OPEN-CHANNEL FLOW,
Colorado State Univ., Fort Collins.
W. W. Sayre.
Hydrology Papers, No 75, August 1975. 73 p, 48 fig, 7 tab, 47 ref, 1 append.

Descriptors: *Dispersion, *Sediment transport, *Boundary processes, *Bed load, *Diffusion, Turbulence, *Open channel flow, Water pollution, Numerical analysis, Computer programs, Hydraulics, Path of pollutants.
Identifiers: Turbulent shear flow, Particulate contaminants, Aris moment transformations, Longitudinal concentration distributions.

The dispersion process for settling particles in a two-dimensional turbulent shear flow was formulated in two differential equations, one for particles suspended in the flow and the other for those deposited on the bed. Exchange of particles between the bed and the flow was permitted. Using the Aris moment transformations, the equations were converted to a more tractable system of equations which were solved by numberical methods with the aid of a digital computer, for the zero'th, first, second, and third moments of the longitudinal concentration distributions. Various combinations of boundary and other input conditions were imposed and their effects on the dispersion process were demonstrated. The results of the numerical solutions together with the results of earlier dispersion experiments with silt particles and fluorescent dyes showed that the tendency of the silt particles toward deposition and temporary storage on the bed can profoundly affect the longitudinal dispersion process. (Singh-ISWS)
W76-04311

A DISPERSION CURVE STUDY OF MODEL DREDGE SPOIL BASINS,
Texas A and M Univ., College Station. Dept. of Civil Engineering; and Texas A and M Univ., College Station. Coastal and Ocean Engineering Div.
For primary bibliographic entry see Field 5B.
W76-04321

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 4 AND 5. ST. LAWRENCE RIVER BASIN, AND HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-04392

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 7. LOWER MISSISSIPPI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-04393

SHORT-HEADED STREAM DELTA: MODEL FOR PENNSYLVANIAN HAYMOND FORMATION, WEST TEXAS,
Geological Survey, Denver, Colo. Coal Resources Branch.
R. M. Flores.
American Association of Petroleum Geologists Bulletin, Vol 59, No 12, p 2288-2301, December 1975. 14 fig, 17 ref.

Descriptors: *Sediment transport, *Streams, *Deltas, *Sedimentology, *Model studies, *Texas, Alluvium, Particle size, Alluvial channels.
Identifiers: *Short-headed stream delta, *Pennsylvania Haymond Formation(West Tex).

Many relatively sophisticated delta models have been developed for ancient sedimentary rocks from data available in recent sediments. Although these models have provided definitive characteristics of many deltaic deposits in the geologic record, they apply primarily to deposits of relatively large river systems. This paper develops a specific lithic model for short-headed stream-delta deposits of the Pennsylvanian Haymond Formation in the Marathon basin, West Texas. The Haymond detrital rock sequence overlying the Dimple Limestone is analogous to some modern deltas in that the coarsening upward is typical of modern prograded sequences. It consists, however, of very coarse-grained delta-plain sediments and delta-front flysch-like sand-silt couplets not common to modern deltas. Perhaps these differences can be attributed to the short-headed nature of the Haymond stream systems which formed small deltas similar to those found on the south shore of Lake Erie. (Woodard-USGS)
W76-04397

GRAPHIC AND TABULAR SUMMARIES OF WATER AND SUSPENDED-SEDIMENT DISCHARGE DURING EIGHT PERIODS OF SYNOPTIC STORM SAMPLING IN THE LOWER DRAINAGE BASIN OF REDWOOD CREEK, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-04398

2K. Chemical Processes

CHEMICAL COMPOSITION OF SNOW IN THE EAST CENTRAL SIERRA NEVADA,
Max C. Fleishmann Coll. of Agriculture, Reno, Nev.
For primary bibliographic entry see Field 2C.
W76-04018

HYDROGEOLOGICAL STUDY OF THE SELKIRK AREA, MANITOBA,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
For primary bibliographic entry see Field 4B.
W76-04162

INDUSTRIAL WATER RESOURCES OF CANADA; HUDSON BAY, LABRADOR AND ARCTIC DRAINAGE BASINS, 1959-1965,
Department of the Environment, Ottawa (Ontario). Water Quality Branch; and Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
For primary bibliographic entry see Field 3E.
W76-04163

WATER QUALITY DATA, BRITISH COLUMBIA 1961 - 71.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 7C.
W76-04171

STUDY OF GROUNDWATER FLOW IN RUSSELL COUNTY, ONTARIO,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environ,ent, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 4B.
W76-04237

THE EFFECT OF CLIMATE ON THE CHEMISTRY OF CARBONATE GROUNDWATER,
McGill Univ., Montreal (Quebec). Dept. of Geography.
For primary bibliographic entry see Field 2F.
W76-04297

REGIONAL HYDROCHEMISTRY OF NORTH AMERICAN CARBONATE TERRAINS,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
R. S. Harmon, W. B. White, J. J. Drake, and J. W. Hess.
Water Resources Research, Vol 11, No 6, p 963-967, December 1975. 2 fig, 4 tab, 27 ref.

Descriptors: *Carbonates, *Water chemistry, Groundwater, *Geochemistry, *North America, Geographical regions, Carbonate rocks, Dolomite, Limestones, Carbon dioxide, Climates, Temperature, Chemistry, Bicarbonates, Hydrogen ion concentration, Calcite, Water quality, Spring waters, Ions, Hydrogeology, Variability, Water temperature, Seasonal, Saturation.
Identifiers: *Regional hydrochemistry, Carbonate terrains, Carbonate groundwater, *Groundwater chemistry, Climatic effects, Ionic strength, Calcium ion, Magnesium ion, Partial pressures.

The chemical variation of water samples drawn from carbonate terrains between southern Canada and northern Mexico was shown to be divisible into, first, variations at the local level due to (1) hydrogeologic conditions (time independent), (2) short-term fluctuations of hydrologic factors (stochastic in time), and (3) seasonal fluctuations of such factors as temperature, precipitation, and plant growth (systematic in time) and, second, regional climatic effects. These regional climatic effects can be satisfactorily represented by mean annual groundwater temperature variation. The regional variation only emerges clearly if care is taken to compare water samples from the same hydrologic class, in this case, springwater. The partial pressure of carbon dioxide with which a springwater sample is in equilibrium is well represented by log P sub $CO2 = a + bT$, where a is of the order of -3.5 and b is approximately 0.07 with P sub CO2 in atmospheres and T in degrees Celsius. (Henley-ISWS)
W76-04298

PRELIMINARY INVESTIGATION OF GROUND-WATER QUALITY AND ITS EFFECT ON SUBURBAN DEVELOPMENT IN WASHOE VALLEY, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5A.
W76-04386

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 4 AND 5. ST. LAWRENCE RIVER BASIN, AND HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-04392

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 7. LOWER MISSISSIPPI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-04393

WATER-QUALITY DATA FROM OIL AND GAS WELLS IN PART OF THE PERMIAN BASIN, SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-04395

2L. Estuaries

RESPONSE TO TIDES OF COASTAL AQUIFERS: ANALOG SIMULATION VS. FIELD OBSERVATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W76-04002

CHEMICALLY INDUCED LESIONS IN ESTUARINE OR MARINE TELEOSTS,
For primary bibliographic entry see Field 5C.
W76-04045

DEEPWATER EXCHANGES IN BUTE INLET, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
C. A. Lafond, and G. L. Pickard.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 11, p 2075-2089, November 1975. 12 fig, 3 tab, 14 ref.

Descriptors: *Water circulation, *Cycles, *Currents(Water), *Density currents, *Inlets(Waterways), *Fjords, *Canada, Dissolved oxygen, Temperature, Salinity, Deep water.
Identifiers: Bute Inlet(British Columbia), Water exchange, Deepwater renewal, Deepwater inflow, Renewal processes.

Bute Inlet is a fjord of the British Columbia mainland coast connected to the Strait of Georgia through Sutil Channel. The properties of the waters in the inlet were observed during a series of cruises from June 1972 to June 1974 with the main objective of determining the water exchange below the top 100 m. Vertical longitudinal sections and time-series plots of salinity, temperature, and dissolved oxygen distributions measured during the 2-yr survey were used to analyze the circulation patterns and renewal processes of the water below 100 m. Inflows of deep water from the Strait of Georgia into Bute occurred frequently during the study period, and took place when the water from the Strait of Georgia above the inlet sill depth was denser than the water in the basin of the inlet. Volumes of some inflows into Bute were estimated, and calculations indicated that inflow speeds could be large enough to be recorded by existing current meters. The renewal of the deep water in Bute Inlet basin appears to be basically consistent with the annual cycle of deepwater replacement in the Strait of Georgia with its year-to-year variations. (Bender-ISWS)
W76-04096

STORM WAVE CLIMATES AT CAPE HATTERAS, NORTH CAROLINA: RECENT SECULAR VARIATIONS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
B. P. Hayden.
Science, Vol 190, No 4218, p 981-983, December 5, 1975. 1 fig, 1 tab, 5 ref. ONR N00014-75-C0480, NPS CX0001-4-0096.

Descriptors: *Ocean waves, *Coasts, *Climatology, *Beach erosion, *North Carolina, Storms, Frequency, Oceans, Waves(Water), Beaches, Sands, Winds, Winter, Weather, Climates, Meteorology.
Identifiers: *Cape Hatteras(NC), *Mid-Atlantic coast.

Mid-Atlantic coastal wave climates have undergone significant change within the last three decades. The duration and frequency of storms generating high waves and the length of the winter storm wave season have increased. These changes may, in part, account for the observed trend in shoreline erosion along the east coast of the United States. (Sims-ISWS)
W76-04101

SOME COMPONENTS OF AN ECOSYST
MODEL OF WESTERNPORT BAY,
Melbourne Univ., Parkville (Australia). Centre
Environmental Studies.
For primary bibliographic entry see Field 5B.
W76-04148

REPORT FOR THE FISCAL YEAR 1972 - 1
STUDY OF THE ST. LAWRENCE RIVER.
St. Lawrence River Working Group, Quebec.
For primary bibliographic entry see Field 4A.
W76-04166

THE RESONANT INSTABILITIES OF LO
WAVES OBLIQUELY INCIDENT ON A BEA
Dalhousie Univ., Halifax (Nova Scotia). Dep
Oceanography.
R. T. Guza, and A. J. Bowen.
Journal of Geophysical Research, Vol 80, No
4529-4534, November 20, 1975. 5 fig, 2 tab, 21

Descriptors: *Waves(Water), *Bea
Resonance, Fluid mechanics, Wavelen
Oceanography, Theoretical analysis, Estua
Ocean waves, Oceans, Gulfs, Energy.
Identifiers: *Long waves, *Resonant instab
Edge waves, Incident waves, Beach cusps, V
trains.

A monochromatic unidirectional wave trai
cident on a plant beach and strongly refl
there, was shown to transfer energy to edge w
of lower frequency through a weak nonline
teraction. For any angle of wave incidenc
most readily excited edge wave perturbation
sists of two low-mode progressive edge w
generally having different frequencies and
numbers, traveling in opposite directions alo
beach. Standing edge waves, which might
stationary morphologic features with a re
longshore rhythm, are theoretically only e
when the primary surface waves are normal
cident. However, edge waves generated by
normally incident primary waves may be lin
features which slowly migrate along shor
beaches bounded by headlands or jettie
progressive edge waves excited would be ref
at both ends, forming a complex pattern of
ing waves. For beaches bounded at one end
one of the edge waves would be standing. R
beach cusps would therefore be expected
vicinity of barriers. These cusps should de
in relief with increasing distance from the ob
as the reflected edge wave, which is not be
tively forced, dies away due to viscous dissi
and further nonlinear interactions. Intrigu
the cusps should have slightly different
lengths on either side of the obstacle. (Lee-I
W76-04300

DIRECTIONAL WAVE SPECTRA
DAYLIGHT SCATTERING,
Raytheon Co., Wayland, Mass. Ad
Development Lab.
R. S. Kasevich.
Journal of Geophysical Research, Vol 80, N
4535-4541, November 20, 1975. 9 fig, 13 ref.

Descriptors: *Ocean waves, *Waves(
*Remote sensing, Photography, Aerial p
raphy, Light, Optical properties, Refle
Gravity waves, Oceans, Fourier a
Oceanography.
Identifiers: *Daylight scattering.

A first-order analysis of the skylight sc
from the sea surface for understandi
mechanism of transfer of wave profile to
graphic image has been given in an earlier
The analysis was extended to second order
merically evaluated for clear blue and
overcast skies. The theoretical results i
experimental conditions required to ob
photographic transparency with optical
mittance linearly proportional to sea wave

imental parameters included sun angle, a orientation, and maximum wave slope. er analysis of the transparency by coherent l processing methods gives the directional r density spectrum of the wave field. (Sims-)
04301

FLOW OF A TWO-LAYER FLUID OVER GRAY IN A POLAR OCEAN,
achusetts Inst. of Tech., Cambridge. Dept. of rology.
al of Physical Oceanography, Vol 5, No 4, p 24, October 1975. 10 fig, 9 ref. NSF DES 74-

iptors: *Model studies, *Ocean currents, ns, *Polar regions, Mathematical models, mechanics, Flow, Topography, Cold re- Coriolis force, Ocean circulation, Oceanog-

o-layer model was constructed for wind- flow over topography in a closed polar where the variation of Coriolis force with le is negligible. The model equations were ed using scales appropriate for the Arctic . The nonlinear equations governing the ophic flow in the two layers could, for a with strong topography, be reduced to a differential equation. This was solved for a l' topography which mimics the bathymetry Canadian Basin. The asymmetry or inten- ion in the surface water was described as a on of the non-dimensional parameters which n information on the basic stratification, on, and vertical mixing. (Sims-ISWS)
04304

ENERALIZED TENSOR FORMULATION TMOSPHERE AND SEAS DYNAMICS,
nal Aeronautics and Space Administration, ey Station, Va. Langley Research Center.
imary bibliographic entry see Field 2A.
04317

ARY STUDIES,
onmental Protection Agency, Cincinnati, Office of Water Programs.
imary bibliographic entry see Field 5B.
04319

FEDERAL RULE OF ACCRETION AND FORNIA COASTAL PROTECTION,
imary bibliographic entry see Field 6E.
04338

ED AND SUBSOIL - FEDERAL V STATE TROL IN U.S. (DISCUSSION OF UNITED ES V MAINE).
imary bibliographic entry see Field 6E.
04344

CALIFORNIA COASTAL ZONE CONSER- ON ACT OF 1972 (PROPOSITION 20) AND PARABLE LAND USE LIMITATIONS AF- ING THE MINERAL INDUSTRY IN R STATES,
n Petroleum Co., Forth Worth, Tex.
imary bibliographic entry see Field 6E.
04345

MISSISSIPPI PUBLIC TRUST DOCTRINE: IC AND PRIVATE RIGHTS IN THE TAL ZONE,
imary bibliographic entry see Field 6E.
04348

THE USE AND LEGAL SIGNIFICANCE OF THE MEAN HIGH WATER LINE IN COASTAL BOUNDARY MAPPING,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-04355

STATE COASTAL ZONE MANAGEMENT PROGRAM.
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-04446

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

COUNTERCURRENT FLOW OSMOTIC PROCESSES FOR THE PRODUCTION OF SOLUTIONS HAVING A HIGH OSMOTIC PRESSURE,
University of the Negev, Beersheba (Israel). Research and Development Authority.
S. Loeb, and M. R. Bloch.
Desalination, Vol 13, No 2, p 207-215, October, 1973. 6 fig, 1 ref.

Descriptors: *Desalination, *Membrane processes, *Reverse osmosis, Flow, Osmotic pressure, Water treatment, Waste water treatment.
Identifiers: Osmotic processes, Countercurrent flow.

Several osmotic processes (concentrate return reverse osmosis, osmotic sink reverse osmosis, and osmotic sink osmosis) may be used to produce or further concentrate solutions having high osmotic pressures. These processes all involve countercurrent flow, on opposite sides of a semipermeable membrane, of the permeant donating (concentrating) solution and the permeant receiving (diluting) solution. The processes depend on the fact that, at any point in the train of membranes, the permeant receiving solution has a higher osmotic pressure than the permeant. This effect is achieved by the injection of a solution having a high osmotic pressure at the beginning of the permeant receiving side of the countercurrent system. (Murphy-FIRL)
W76-04185

APPLIED RESEARCH FOR RO AND UF,
Lund Univ. (Sweden). Food Engineering Div.
For primary bibliographic entry see Field 5D.
W76-04217

TREATMENT OF SEA WATER PRODUCES HIGH-QUALITY REACTOR COOLANT,
Southern California Edison Co., Los Angeles, Calif.
M. K. Sullivan.
Power Engineering, Vol 80, No 1, p 44-47, January 1976. 3 fig.

Descriptors: Water quality control, Water purification, *Water treatment, Water pollution control, Nuclear powerplants, Sea water, *Evaporation, *Desalination, Demineralization, Cooling water, *Ion exchange, Resins, *Cation exchange, *Anion exchange, Waste disposal, Radioactive waste disposal, California.
Identifiers: Lithium-7 resin, Radwaste deionizers, San Onofre(Calif).

San Onofre, a nuclear generating station in Southern California, needs a reliable supply of thousands of gallons of high-quality cooling water. Flash evaporators produce a total of 100 gpm of high-quality water from the Pacific Ocean. Reactor coolant quality is maintained through a bypass chemical and volume control system. The coolant passes through parallel mixed bed deionizers consisting of a strongly acidic cation exchange resins in the lithium-7 form and a strongly basic anion exchanger in the hydroxide form to remove actived products of corrosion and erosion. Some means of lithium removal must be incorporated in the system. This is accomplished by a hydrogen-form cation exchange unit which is also useful to remove cesium and cobalt during clean-up operations. A ceramic filter removes particulate matter from effluent flowing from the demineralizers. The system also contains mean to add other chemicals as necessary. The radioactive waste system removes and concentrates gas and liquid wastes throughout the plant. Borated reactor coolant first enters a flash tank. Vapor from the flash tank is collected and stored in waste gas decay tanks before processing in a cryogenic purification system and disposal up the stack. After flashing, contaminated coolant is pumped to liquid waste holding tanks. Then it passes in series through liquid waste ion exchangers. If minimum release specifications are met it is discharged through a new ion exchanger and gas stripper and passes to a circulating water outfall where it is diluted with condenser water and discharged to the sea. If contents do not meet release requirements it is processed through a new ion exchanger consisting of four mixed-bed units. (Sinha-OEIS)
W76-04262

PROCESS FOR PRETREATING SEA WATER BY PREHEATING SAME IN THE PREPARATION OF BRINE AND FRESH WATER,
H. Tabata, and N. Tabata.
US Patent No 3,923,607, 3 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 301, December 2, 1975.

Descriptors: *Patents, *Desalination, *Desalination processes, *Separation techniques, Water treatment, Water purification, Sea water, *Flash distillation, Calcium, Sodium chloride.
Identifiers: Heat exchange, *Pre-treatment(Sea water).

In a method for preparing brine and fresh water from sea water by heating the sea water in a multiple effect multi-stage flash evaporator., the sea water first enters the final heat rejection stages of the flash evaporator and is passed in indirect heat exchange with vapor from the flashing sea water in the heat rejection stages to condense the vapor and preheat the sea water. The sea water is treated with magnesium carbonate to remove calcium and is deaerated at a pH of 5.0 to 5.5. The sea water is introduced to the terminal flash stage of the first effect of the evaporator to be further flash evaporated. The entering sea water is additionally preheated to about 50 deg to 65 deg C in a separate preheating stage prior to being subjected to the calcium removal and deaeration steps where after deaeration, the temperature of the thus treated sea water is about the same as it is in the terminal flash stage. (Sinha-OEIS)
W76-04277

MAGNETIC APPARATUS FOR TREATING LIQUIDS CONTAINING CALCAREOUS MATTER,
For primary bibliographic entry see Field 5D.
W76-04283

REVERSE OSMOSIS APPARATUS,
United Kingdom Atomic Energy Authority, London (England). (Assignee).
J. R. Grover, R. Gayler, and M. H. Delve.
U.S. Patent No 3,923,664, 4 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 319, December 2, 1975.

Descriptors: *Patents, *Reverse osmosis, *Waste water treatment, Water quality control, *Membrane processes, Separation techniques, *Desalination, Equipment, Saline water.

A reverse osmosis apparatus comprises a pressure shell, a feed solution inlet, a feed solution outlet, a product outlet, a membrane assembly within the pressure shell, and shell partition means for directing feed solution over parts of the assembly in a sequential manner. The shell partition means reduces the cross-sectional area of the feed solution flow path and allows a smaller capacity pump to be used so as to yeild a higher product water recovery from a lower capacity plant. The invention also allows the pressure shell to be of right-circular cylindrical form and the shell partition means to be arranged so that the feed solution inlet and feed solution outlet are placed at the same end of the pressure shell and the product outlet may be at the other end of the pressure shell. This arrangement allows ease of replacement of rod bundles which use large numbers of rods. (Sinha-OEIS)
W76-04286

3B. Water Yield Improvement

GEOTHERMAL WATER RESOURCES IN ARIZONA: FEASIBILITY STUDY,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 4B.
W76-04005

EFFICIENT RESERVOIR DESIGN FOR PLAYAS OF THE SOUTHERN HIGH PLAINS,
Southwestern Great Plains Research Center, Bushland, Tex.
A. D. Schneider.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 5, p 892-896, September-October 1975. 5 fig, 3 tab, 11 ref.

Descriptors: *Playas, *Reservoir design, *Dikes, *Storage, *Optimization, Diversion, Design data, Excavation, Mathematics, Runoff, Reservoirs, Water storage, *Great Plains.
Identifiers: *Southern High Plains, Playa modification.

Evaporation losses from the shallow playas of the Southern High Plains can be reduced by storing the water in deep reservoirs with small surface areas. The reservoir storage is obtained most economically by construction a dike through the playa and diverting all runoff into the diked reservoir. For equal dike heights and reservoir areas, an efficient reservoir is obtained by maximizing the ratio of the reservoir area to the dike length. Optimality mathematics was used to maximize this ratio for sector, parabolic and circular arc dikes within a flat-bottomed, circular playa. The maximum ratios for the three dike shapes were nearly equal; the sector dike reservoir was selected for field application because of its simplicity. Design data were developed for sector dike reservoirs covering from one-tenth to one-half of the playa bottom. The water stored per unit of earth excavated was much higher than for earlier playa modification models. (Singh-ISWS)
W76-04296

3C. Use Of Water Of Impaired Quality

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
W. E. Martin, and M. A. Boster.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 474, $4.00 in paper copy, $2.25 in microfiche. Completion Report, November 1975. 27 p, 7 fig, 1 tab, 17 ref. OWRT A-048-ARIZ(2). 14-31-0001-4003.

Descriptors: *Salinity, *Linear programming, Irrigation, *Water quality, *Arizona, Irrigation water, Colorado River, *Imported water, *Mathematical models.
Identifiers: Agricultural adjustment, *Irrigation water quality, Central Arizona project.

Upon completion of the Central Arizona Project (CAP), Colorado River water will be delivered to Pinal County for agricultural use. Any new importation of water to an area implies adjustments in the organization of the economy of the area. For irrigated agriculture, adjustments will occur in input mix, output mix, acreage farmed, and in gross and net incomes. A complicating factor associated with importation of Colorado River water is that the imported water will contain different dissolved salt concentrations than the groundwater and surface water currently being used. Mathematical programming models of representative irrigated farms in Pinal County are used to project adjustments implied under several assumptions as to the availability, cost and salinity of the various sources of irrigation water. It is found that (1) most monetary benefits of the Project will be captured by the Indian farmers of the county, (2) groundwater conservation will be minimal unless farmers are forced to purchase large quantities of CAP water, (3) provision of CAP water will not affect cotton acreage but will significantly increase the acreage of small grains and alfalfa, (4) the possibility of increased salinity from CAP water should not be of concern to farmers in the county since projected decreases in net income occurring because of increased salinity average only 61 cents per acre per year, and (5) increased income to non-Indian farmers resulting from provision of CAP water at thecurrently proposed price will not be sufficient to pay the additional fixed costs for distribution systems.
W76-04004

IRRIGATION RETURN FLOW, A BIBLIOGRAPHY.
Office of Water Research and Technology, Washington, D.C
For primary bibliographic entry see Field 5B.
W76-04230

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME II,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W76-04244

LAND DISPOSAL OF SEWAGE SLUDGE, VOLUME II, (APRIL, 1973-MARCH, 1974).
Guelph Univ. (Ontario). Dept. of Land Resource Science; and Guelph Univ. (Ontario). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-04247

IRON-INDUCED ORANGING DISEASE OF RICE IN RELATION TO PHYSICOCHEMICAL CHANGES IN A FLOODED OXISOL,
Centro Internacional de Agricultura Tropical, Bogota (Colombia).
For primary bibliographic entry see Field 5C.
W76-04339

SALTING THE EARTH,
Worldwatch Inst., Washington, D.C.
E. P. Eckholm.
Environment, Vol. 17, No. 7, p 9-15 (1975). 7 p, 5 photo, 23 ref.

Descriptors: *Saline soils, *Soil contaminati
*Irrigation systems, *Irrigation efficien
*Silting, *Saline water intrusion, Saline wat
Freshwater, Soils, Soil contamination effects,
rigation practices, Irrigation water, Reservo
Water table, Groundwater, Water quality, Irri
tion effects, Agronomic crops, Crop respon
Crops, Crop production, Sedimentation, Encro
ment.
Identifiers: *Siltation.

The efficiency of irrigation works, a subject
vital concern in ensuring adequate food suppl
is being seriously threatened. Soil salinity
problem often associated with poor irriga
management, is significantly undermining
productivity of a large portion of the world'
rigated lands. At the same time, large silt lo
caused by the erosion of soils are clogging m
reservoirs and waterways. Salinization is ca
by a natural process which increases the salt
centration in the water not used by plants. Bec
of this process, getting rid of excess irriga
water is critical; otherwise, the excess waters
percolate down to the underground water tabl
the absence of any drainage, the water table
then rise to the root zone, where its brackish
stunts or prohibits crop growth. In additio
salinization, irrigation works are subjec
damage from siltation. In a number of exam
this article shows how a dam's reservoir cap
may be seriously reduced because dambuilder
derestimated the threat of siltation. (Hoff
Florida)
W76-04352

3D. Conservation In Domestic a Municipal Use

SPECIAL CHARACTERISTICS OF UR HYDROLOGY,
American Society of Civil Engineers, Marble
Mass. Urban Water Resources Research Prog
For primary bibliographic entry see Field 2A.
W76-04138

CATCHMENT MODELS FOR URBAN ARE
Snowy Mountains Engineering Corp., C
(Australia).
For primary bibliographic entry see Field 2A
W76-04139

STATISTICAL ESTIMATION OF A DE FUNCTION FOR RESIDENTIAL WATER,
Department of the Environment, C
(Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 6D
W76-04236

MODELS FOR MUNICIPAL AND INDUST WATER DEMAND FORECASTING IN N CAROLINA,
North Carolina Univ., Chapel Hill. Dept.
vironmental Sciences and Engineering.
For primary bibliographic entry see Field 6D
W76-04390

3E. Conservation In Industry

GEOTHERMAL WATER RESOURCE ARIZONA: FEASIBILITY STUDY,
Arizona Univ., Tucson. Dept. of Geoscienc
For primary bibliographic entry see Field 4B
W76-04005

COMPLETE RECOVERY OF ITALIA PLANT WASTE WATERS,
Smogless Italiana Spa, Milan (Italy).
For primary bibliographic entry see Field 5D
W76-04053

OVERY OF FELDSPAR AND GLASS SAND M GEORGIA WASTE GRANITE FINES,
u of Mines, Tuscaloosa, Ala. Tuscaloosa lurgy Research Lab.
rimary bibliographic entry see Field 5D.
04073

MILL GETS ITS OWN OXYGEN RATOR.
imary bibliographic entry see Field 5D.
04076

CLING AND RECLAMATION--FACT OR ERVICE.
imary bibliographic entry see Field 5D.
4084

CLING OF WASTE IN THE MEAT IN-RY,
y Shortland Ltd. Auckland, New Zealand.
mary bibliographic entry see Field 5D.
4088

TRIAL WATER RESOURCES OF DA; HUDSON BAY, LABRADOR AND C DRAINAGE BASINS, 1959-1965,
ment of the Environment, Ottawa o). Water Quality Branch; and Department Environment, Ottawa (Ontario). Inland Directorate.
Thomas, and R. M. Gale.
Survey Report No 15, 1973. 147 p, 4 fig, 6 ppend.

tors: *Chemical analysis, *Municipal *Water quality, Water resources, Surface Water supply, Geology, Hardness(Water), ogy, Population, Surveys, Water treat-nalytical techniques, *Canada.
ers: *Hudson Bay, *Arctic drainage basin, dor drainage basin.

he final part of the series of Water Survey of the industrial water resources of and deals with the Hudson's Bay, r, and Arctic drainage basins. Chemical of water from 216 stations are recorded, scriptions of 49 municipal and 17 other upplies. Records between 1947 and 1961 uded. The geology of the drainage basins, edures used and the analytical techniques d are summarized briefly. The waters ely in hardness; mineral content is mainly earth bicarbonates; alkalies, sulphates and are low. (Environment Canada)
63

MENTAL BURNING OF WASTE OIL EL IN CEMENT MANUFACTURE,
nental Protection Service, Ottawa . Water Pollution Control Directorate.
ary bibliographic entry see Field 5A.
77

AL RECOVERY PLANT IS FINAL F $9.2 MILLION WASTE PROGRAM,
ry bibliographic entry see Field 5D.
5

RK FIRM BUYS CHEMICAL WASTES YCLING.
ry bibliographic entry see Field 5D.
6

WATER RECYCLING PROCESS,
ry bibliographic entry see Field 5D.
3

CONTINUOUS ION EXCHANGE IN FLUIDIZED BEDS,
Bradford University, Yorks, United Kingdom, Schools of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W76-04212

THE CLOSE CIRCUIT OF INDUSTRIAL WASTE WATERS (DER GESCHLOSSENE KREISLAUF BEI INDUSTREABWASSERN),
For primary bibliographic entry see Field 5D.
W76-04215

PROTEIN RECOVERY FROM DAIRY WASTES BY ELECTROFLOTATION,
For primary bibliographic entry see Field 5D.
W76-04216

WATER RECYCLING IN THE PULP AND PAPER INDUSTRY,
Buckeye Cellulose Corp., Memphis Tenn.
For primary bibliographic entry see Field 5D.
W76-04222

FIBER RECOVERY INCREASES WATER REUSE AND REDUCES WASTE TREATMENT COSTS,
Dorr-Oliver, Inc., Stamford, Conn.
For primary bibliographic entry see Field 5D.
W76-04224

CLOSED LOOP WATER-SYSTEMS AT RED RIVER VALLEY FACTORY,
Red River Valley Cooperative, Hillsboro, N. Dak.
For primary bibliographic entry see Field 5D.
W76-04225

CLOSED-LOOP FILTRATION SYSTEMS HELP MIDWEST SUGAR BEET PLANT MAINTAIN HIGH WATER QUALITY,
River River Valley Cooperative, Hillsboro, N. Dak.
For primary bibliographic entry see Field 5D.
W76-04226

WATER TRANSPORT OF WOOD: THE CURRENT SITUATION,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W76-04261

TREATMENT OF SEA WATER PRODUCES HIGH-QUALITY REACTOR COOLANT,
Southern California Edison Co., Los Angeles, Calif.
For primary bibliographic entry see Field 3A.
W76-04262

APPARATUS FOR PROCESSING FLUSHING LIQUOR FROM A GAS MAIN OF COKE OVENS,
Otto (C.) and Co., G.m.b.H., Bochum (West Germany). (Assignee).
For primary bibliographic entry see Field 5D.
W76-04282

LEGAL PROBLEMS INVOLVED IN DEVELOPING WATER SUPPLIES FOR ENERGY DEVELOPMENT,
Debevoise and Liberman, Washington, D.C.
J. C. Muys.
Natural Resources Lawyer, Vol 8, No 2, p 335-46 (1975). 12 p.

Descriptors: *Hydroelectric power, *Federal government, *Water rights, *Energy, *Diversion, Coals, Oil, Gases, Slurries, Cooling, Jurisdiction, Beneficial use, Reclamation, Hydroelectric project licensing, Navigable waters, Grants, Management, Water surplus, Eminent domain, Streams, Federal Reclamation Law, Federal Power Act(FPA).
Identifiers: *Federal-interstate compact, Coal slurry pipelines, Licenses.

One aspect of the legal system for obtaining water rights in the West is the body of jurisprudence relating to Indian water rights. Another is that providing for acquisition of water rights for various beneficial uses. Water rights may also be acquired by contract from federal projects, while non-federal water resources development projects involving hydroelectric generation must be licensed by the Federal Power Commission (FPC). The relationships among these various systems is less than clear, especially since the federal common law of interstate water compacts must also be considered in evaluating the availability of a water supply for an energy development project. In this regard, specific areas are analyzed relating to National Environmental Policy Act requirements, and to litigation involving the authority of the FPC to license stream electric generating plants, coal slurry pipelines, and hydroelectric project licensing. The conclusion drawn is that the problems presented can best be dealt with on a regional basis through the institutional device of the federal-interstate compact. (Segall-Florida)
W76-04336

MODELS FOR MUNICIPAL AND INDUSTRIAL WATER DEMAND FORECASTING IN NORTH CAROLINA,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 6D.
W76-04390

MINERAL AND WATER RESOURCES OF SOUTH DAKOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-04400

3F. Conservation In Agriculture

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3C.
W76-04004

SOIL COMPACTION DUE TO HARVEST TRAFFIC IN SUGARCANE FIELDS ON A LAJAS VALLEY FARM OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Agricultural experiment Station.
L. N. Shukla.
The Journal of Agriculture of the University of Puerto Rico, Vol. 58, No. 3, p 279-292, July, 1974. 14 fig.

Descriptors: *Agriculture, *Agronomy, *Soil compaction, Soil moisture meters, Soil moisture, Food and cover crops, *Puerto Rico, Sugarcane.
Identifiers: Agricultural machinery, *Sugarcane harvesting.

Large and heavy machinery has recently been introduced on Puerto Rico for the harvesting, loading, and transporting of sugarcane. These machines have increased the soil compaction, and tests were conducted on a farm in the Lajas Valley of Puerto Rico to determine the effects of different types of machinery on the soil. The degree of compaction caused in the center of furrows by a J and L harvester and in the banks of ridges by

loaded transport carts was measured. The extent of soil compaction was determined by taking penetrometer readings before and after the vehicles had passed over the area. Soil moisture was measured by the oven-dry method. It was concluded that the harvester did not cause severe soil compaction but that the loaded transport carts caused considerable compaction in the banks of the ridges. (Orr-FIRL)
W76-04089

AUTOMATIC APPARATUS FOR IRRIGATION, WITH TIMER,
F. Roveda.
U.S. Patent No. 3,921,904, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 940, No 4, p 1836, November 25, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Water distribution(Applied), Distribution systesm, Sprinkler irrigation, Application equipment, *Timing, *Automatic control.

An apparatus for watering pot-plants, flowerbeds or gardens, at pre-established intervals, and for pre-established periods of time is described. The apparatus is suitable for spreading and nebulizing the irrigating water jet. The apparatus achievs its objectives by means of a timer disc which is continuously moved by a small electric motor and which has housings for cams, on which can be placed cams of different dimensions, suitable for controlling, by means of a lever device, the closing of an electric circuit which controls the flow of irrigating water. In addition to this device there is a diffusing device, to be placed in the ground tp be watered, and which consists of a spraying nozzle and a plate opposite to it. (Sinha, OEIS)
W76-04265

SOIL IRRIGATION METHODS AND APPARATUS,
Hawaiian Sugar Planters Association Experiment Station, Honolulu. (Assignee)
B. A. McElhoe, and J. G. Tabrah.
US Patent No 3,921,905, 6 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 940, No 4, p 1836, November 25, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, Irrigation practices, Water delivery, Water distribution(Applied), Irrigation efficiency, Flow control.
Identifiers: *Drip irrigation, Flushing, Drip tubes.

A soil irrigating system includes drip tubes connecting with a supply of pressurized water to dispense a substantially continuous flow of water to the soil. Flushing valves are connected to remote ends of the drip tubes to periodically flush the tubes clean. Each flushing valve comprises an inlet connecting with a drip tube, an outlet for discharging water from the drip tube, a pilot opening arranged to introduce pressurized pilot water to the valve, and a valve element of resiliently deformable material. The valve element has a recessed configuration suitable for enabling the valve element to extend longitudinally forward and radially outward into a sealing posture in response to urgings of pressurized pilot water at the pilot opening, to prevent discharge of water from the remote end of the associated drip tube. When water pressure at the pilot opening is relieved, water pressure from the drip tube shifts the valve element to an open position to enable water to be flushed from the drip tubes. A valved manifold is provided to conduct pressurized liquid to the pilot openings to simultaneously shift the valve elements to their closed positions to prevent flushing of the drip tubes. The valve manifold is also able to relieve liquid pressure at the pilot openings so that the valve elements are simultaneously shifted to their open position by water pressure from the drip tubes, to permit flushing of the drip tubes. (Sinha-OEIS)
W76-04266

CORNER IRRIGATION MACHINE,
Lindsay Mfg Co., Nebr. (Assignee)
A. L. Zimmerer.
US Patent No 3,921,908, 3 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 940, No 4, p 1837, November 25, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation design, *Irrigation practices, Irrigation efficiency, Water utilization, Water distribution(Applied).
Identifiers: *Center pivot irrigation system.

In a center pivot irrigation system, the mechanism described provides for irrigating or watering the corner of a generally square field which the circular pattern of a conventional center pivot system cannot otherwise reach. To irrigate the corners a boom mechanism is mounted on and supported by the outermost tower and is constructed to extend beyond it by a substantial distance. A pipeline is connected to the boom in a conventional manner and the system pivots clockwise. When the end of the rig is opposite a side of the field, the boom may be folded back to a position more or less tangent to the circle. Then the boom will not extend out over the edge of the field and possibly interfer with a fence, trees or roads. As the system moves to a position opposite the corner, a control mechanism may energize the drive and cause the boom to pivot out to its fully extended position. Thus the boom may be in its fully extended position for some 10 to 20 deg of system rotation. (Sinha-OEIS)
W76-04267

POP-UP SPRINKLER WITH MULTIPLE-PURPOSE ONE-PIECE SEAL,
Nelson (L. R.) Corp., Peoria, Ill. (Assignee)
J. R. Hayes, and K. J. Bruninga.
US Patent No 3,921,910, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 940, No 4, p 1838, November 25, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation practices, Irrigation efficiency, Irrigation operation and maintenance, Water control, Sealants, Leakage.
Identifiers: *Pop-up sprinklers.

A pop-up sprinkler has a multiple-purpose one-piece annular seal which performs specific functions. It provides a static seal between the separable parts of the sprinkler housing assembly. It provides a spring seat for one end of the retracting coil spring. It provides a pressure responsive leakage path between the fixed housing assembly and movalbe sprinkler head assembly for passage of water. When the water source is innitially started it removes contiguous debris and prevents passage of debris downward through the housing during the extending movement of the sprinkler head assembly. The seal also provides an operative static seal between the fixed housing assembly and the sprinkler head assembly when the latter is in its operative extended position. Finally the seal provides a wiping and centering action on the sprinkler head assembly during the retracting movement. (Sinha-OEIS)
W76-04268

MOBILE IRRIGATION SYSTEM,
Shur-Rane Corp., San Jose, Calif. (Assignee)
J. A. Mortimer.
US Patent No 3,923,249, 3 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 190, December 2, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation operation and maintenance, Irrigation practices, Pipes.
Identifiers: Mobile irrigation system.

An improved, mobile irrigating system has a plurality of wheel-mounted irrigating pipes coupled in line to a central, internal combustion engine powered unit which turns the irrigating pi wheels by turning the line of coupled pipes. T improvement comprises a sealed, hollow cr support structure for the central power unit, hollow space of the cross support constitutin fuel tank for the engine, and indicator me mounted on selected ones of the wheels aligned with each other to indicate the rotati orientations of the pipes about their longitud axes. A hollow, T-shaped pipe is mounted wi the hollow cross support and a hollow fit passes into the hollow of the cross support an sealed to the midpoint of the T-shaped pipe establish fluid communication. The filling is nected by a pipe to the engine and the distal e of the T-shaped pipe are positioned within ends of the hollow cross support. Check v means are mounted within the distal ends of th shaped pipe so that fuel within the hollow c support may be sucked through the T-shaped by the engine regardless of the attitude of the c support with respect to gravitational forces w micht cause the fuel within the ccross suppo accumulate at one end. (Sinha-OEIS)
W76-04276

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

DEVELOPMENT PRIORITIES IN THE Y RIVER REGION, NORTH DAKOTA, A SO ATTITUDE AND COMMUNICATION AN SIS,
North Dakota Univ., Grand Forks. Comm tion Research Center
For primary bibliographic entry see Field 6B.
W76-04007

DERIVATION AND EVALUATION OF R VOIR RULE CURVES,
Cornell Univ., Ithaca, N.Y. School of Civ Environmental Engineering.
B. A. Newman, and D. P. Loucks.
Available from the National Technical In tion Service, Springfield, Va 22161 as PB-24 $5.00 in paper copy, $2.25 in microfiche. (University Water Resources and Marine Sc Center Technical Completion Report, Dec 1975. 73 p, 6 fig, 9 tab, 12 ref, 2 append. OW 051-NY(1). 14-31-0001-5032.

Descriptors: *Reservoir operation, *Re yield, Reservoir storage, *Project pl *Optimum development plans, Linea gramming, *Optimization, Systems a Simulation analysis, Model studies, *Multi pose reservoirs, Computer models.
Identifiers: *Rule curves.

A deterministic preliminary screening m planning multiple-purpose multiple-reservo basin projects is presented. The model, b linear programming, both optimizes eng parameters and provides sufficient inform define explicitly reservoir operating polic curves). The effectiveness of this technique for defining both reservoir c and reservoir operating policies that streamflows of the desired quantities and ties is demonstrated by using the model t multiple-reservoir example problem base tual streamflow data. The linear prog model defines explicitly both the rule cu the cost effective capacity of each reserv ing the solution of the example problem. not explicitly defined by the model is ch the modeler for coordinating the operati multiple-reservoir system; the performan system is then tested using a simulati

on the historical streamflow data. The of this simulation show that the solution to mple problem produces the desired stream- vith remarkable accuracy. A significant ad- of this methodology for preliminary ng of alternative river basin systems is the of simplicity commensurate with the ex- s of the preliminary planning stage. 014

UNITY VALUES AND COLLECTIVE N IN RESERVOIR DEVELOPMENT,
tate Univ., Ames. Dept. of Sociology and ology.
nary bibliographic entry see Field 6B. 015

CTION IN CATCHMENT HYDROLOGY.
an Academy of Science, Camberra.
nary bibliographic entry see Field 2A. 128

ICAL METHODS FOR PREDICTING ITATION IN CATCHMENT HYDROLO-
an Numerical Meteorology Research Cen- bourne (Australia).
nary bibliographic entry see Field 2B. 29

MFLOW IN CATCHMENT LING,
Univ., Clayton (Australia). Dept. of Civil ring.
ary bibliographic entry see Field 2E. 35

CAL METHODS AND APPROXIMA- IN THE DETERMINATION OF MENT RESPONSE,
wealth Scientific and Industrial Research tion, Canberra (Australia). Div. of Land earch.
dy.
ction in Catchment Hydrology. Australian of Science, Canberra, Australia, 1975. p 18 ref.

ors: *Estimating equations, *Streamflow, lic structures, *Design data, eds(Basins), *Rainfall-runoff relation- eviews, Flood control, Flood peak, Ra- mula, Unit hydrographs, Model studies, l models, Water yield, Surface runoff.

is presented of the procedures which n developed by practitioners to obtain ata for hydraulic structures associated ontrol of natural stream flow. Because of ents for simplicity, objectivity, and ac- of data, these are not usually the which could be synthesised by the use of search findings. The methods considered peak formulae, the rational formula, unit hs, statistical models, catchment yield , and conceptual models. The adequacy procedures is considered in relation to esearch developments. (See also W76- SIRO)
l

EVALUATION, TESTING AND TERS ESTIMATION IN HYDROLO-
h Wales Univ., Kensington (Australia). Civil Engineering.
y bibliographic entry see Field 2A. 2

SYNTHETIC INPUT DATA TIME SERIES FOR CATCHMENT MODEL TESTING,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 2A.
W76-04144

PREDICTIVE USE OF CATCHMENT OUTPUTS,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
T. A. McMahon.
In: Prediction in Cacthment Hydrology. Australin Academy of Science, Canberra, Australia, 1975. p 371-425. 16 fig, 12 tab, 94 ref.

Descriptors: *Reviews, *Streamflow forecasting, *Reservoir yield, *Statistical models, Discharge(Water), Markov processes, Hydrologic data, Streamflow, Australia, Forecasting, Duration curves, Frequency curves, Low flow, Runoff forecasting.

A review of techniques for predicting outflow from catchments with or without reservoir storage is presented. An outline is given of techniques for defining streamflow data characteristics, and a range of values illustrating the diversity of Australian streamflow is tabulated. Data generation techniques, including Markov and related models, mixed autoregressive integrated moving average (ARIMA) models, and multi-site models, are discussed and compared. Major storage-yield methods are classified (into critical-period and probability-matrix types) and reviewed, with results of their application to Asutralian streams. Procedures for determining yield from unregulated catchments - flow duration curves and low flow frequency curves - are also considered. (See also W76-04128) (CSIRO)
W76-04145

TRENDS IN CATCHMENT MODELLING,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 2A.
W76-04147

SURFACE WATER DATA, BRITISH COLUMBIA 1974.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04150

INVENTORY OF CANADAIN FRESHWATER LAKES.
Department of the Environment, Ottawa (Ontario). Inland Waters Directories; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W76-04153

CANADA CENTRE FOR INLAND WATERS - 1973.
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-04155

FLOOD HAZARD MAP, FREDERICTON AREA, NEW BRUNSWICK, NORTHWEST SHEET.
Department of the Environment, Ottawa (Ontario); and New Brunswick Dept. of Fisheries and Environmental.
For primary bibliographic entry see Field 7C.
W76-04157

FLOOD HAZARD MAP, FREDERICTON AREA, NEW BRUNSWICK, SOUTHEAST SHEET.
Department of the Environment, Ottawa (Ontario); and New Brunswick Dept. of Fisheries and Environment.
For primary bibliographic entry see Field 7C.
W76-04158

REFERENCE INDEX - CANADA 1972 - HYDROMETRIC MAP SUPPLEMENT.
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04160

NIAGARA RIVER ACOUSTIC STREAMFLOW MEASUREMENT SYSTEM,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7B.
W76-04165

REPORT FOR THE FISCAL YEAR 1972 - 1973: STUDY OF THE ST. LAWRENCE RIVER.
St. Lawrence River Working Group, Quebec.
Environment Canada, Ottawa, Canada, March, 1973. 16 p, 1 map, Available in English and French.

Descriptors: *St. Lawrence River, *Water resources, *Water quality, Industrial wastes, Effluents, Municipal wastes, Heavy metals, Mathematical models, TEMPERATURE, Remote sensing, Sedimentology, Planning, Geomorphology, Analysis, *Surveys, *Canada.
Identifiers: Waste water works, Bacteriology, Organic contaminants.

The Canada-Quebec St. Lawrence River Working Group is composed of representatives of Environment Canada, Canada Department of Transport, Quebec Water Board and the Quebec Department of Natural Resources. Projects carried out include studies of water quality, limnology, hydrology, and hydraulic sciences, dispersion and assimilation, public participation, socio-economic factors, thermal regime, and shoreline morphology. These aspects were studied in reference to various water uses; municipal and industrial water supply, conservation of aquatic fauna and flora; recreation, tourism, navigation, and hydro-electric power. Outlines and conclusions of major projects are given, with plans of the next year's operations. (Environment Canada)
W76-04166

SURFACE WATER DATA, ALBERTA 1974.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04167

SURFACE WATER DATA, ALBERTA 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04168

SURFACE WATER DATA, ATLANTIC PROVINCES 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04169

SURFACE WATER DATA, SASKATCHEWAN 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04170

MONOGRAPH ON COMPREHENSIVE RIVER BASIN PLANNING.
Department of the Environment, Ottawa (Ontario).
Information Canada, Ottawa, 1975. 246 p, 9 fig, 13 tab, 120 ref, 2 charts.

Descriptors: *Comprehensive planning, *Planning, *River basin development, Water management(Applied), Institutions, Governments, Project planning, Evaluation, Mathematical models, Financing, Water resources development, Economics.
Identifiers: Information systems.

This treatise is concerned with the range of social, political, and biological problems which arise in a river basin as the population and the level of development in that basin increase. The approach used is one of reducing a complex problem to its individual elements, of analysing those elements and re-assembling them in the form of a plan for action. Wherever possible, the experience of the St. John River Basin planning program is used to illustrate specific points. The monograph is arranged in three parts which form the main stages of any planning process: the preliminary stage, the substantive planning stage, and the transition stage from planning to action. (Environment Canada)
W76-04175

MACKENZIE BASIN INTERGOVERNMENTAL LIAISON COMMITTEE - FIRST REPORT (TO DECEMBER 31, 1974).
Mackenzie Basin Intergovernmental Liaison Committee, Ottawa (Ontario).
For primary bibliographic entry see Field 6E.
W76-04176

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO 1, REGRESSION OF MEAN ANNUAL FLOODS ON PHYSIOGRAPHIC PARAMETERS,
Environmental Protection Service, Vancouver (British Columbia). Pacific Region.
For primary bibliographic entry see Field 2E.
W76-04180

CALIBRATION OF THE STATE WATER PLANNING MODEL FOR SUB-BASIN 42-KJ OF THE YELLOWSTONE RIVER BASIN,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
J. T. Weaver, J. Jaklin, E. P. Smouse, and T. T. Williams.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 667, $7.50 in paper copy, $2.25 in microfiche. Research Report No 73, Montana University Joint Water Resources Research Center, Bozeman, September 1975. 159 p, 23 fig, 22 tab, 13 ref, 4 append. OWRT B-029-MONT (8) and OWRT B-038-MONT (1).

Descriptors: *Reservoir operation, *Optimum development plans, Operations, *Planning, *Regression analysis, Hydrology, *Model studies, *Montana, Watershed management, Calibration.
Identifiers: *Yellowstone River Basin(Mont), Fort Union Basin(Mont), Planning models.

A series of three independent but closely related studies have been conducted at Montana State University, aimed at extending the usefulness of the already-developed Montana State Water Planning Model. Some aspects of the State Water Operations Model were also incorporated. Sub-Basin 42KJ consists of the reach of the Yellowstone River basin from the mouth of the Bighorn River at Custer, Montana downstream to the mouth of the Tongue River at Miles City. The area of the sub-basin was found by planimetering to be 4177 square miles. Calibration of the planning-model for Sub-Basin 42-KJ was undertaken in three separate studies: (1) Compilation of data, (2) Calibration of an annual and monthly model; (3) Manipulation of precipitation data to reflect effects of elevation and spacing of raingages. Two methods of estimating the precipitation volume in Basin 42-KJ were applied. Even if it is not known which method yields values closer to the true value, the second method with the adjustment for the elevation differences takes more factors from the meteorological processes in account, and seems to be the superior method if the following improvements could be made: (a) determining the hypsometric precipitation gradient for every season, (b) using a method for determining the influence area of gaging station, which takes orographic barriers into account, (c) using convex or concave slope model for the determinatoin of the mean precipitation of the areas between the contour lines.
W76-04232

RESEARCH PROGRAM - HYDROLOGY RESEARCH DIVISION - SUMMARIES OF PROGRESS AND SHORT RESEARCH REPORTS.
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2A.
W76-04239

SURFACE WATER DATA ATLANTIC PROVINCES 1974.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch.; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04248

SURFACE WATER DATA, YUKON AND THE NORTHWEST TERRITORIES 1974.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04249

SURFACE WATER DATA, MANITOBA 1974.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04250

REVIEW OF CANADIAN DESIGN PRACTICE AND COMPARISON OF URBAN HYDROLOGIC MODELS.
Maclaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 5G.
W76-04254

USES OF WATER RESOURCES DATA,
Department of the Environment, Ot
(Ontario). Water Resources Branch; and De
ment of the Environment, Ottawa (Ontario)
land Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04255

SURFACE WATER DATA, ONTARIO 1974.
Department of the Environment, O
(Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04256

WATER QUALITY DATA, YUKON TERI RY 1961 - 1973.
Department of the Environment, O
(Ontario). Water Quality Branch; and Depar
of the Environment, Ottawa (Pntario).
Waters Directorate.
For primary bibliographic entry see Field 7C
W76-04257

FLOOD DAMAGE IN FREDERICTION.
Department of the Environment,
(Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C
W76-04260

EFFICIENT RESERVOIR DESIGN PLAYAS OF THE SOUTHERN HIGH PLA
Southwestern Great Plains Research
Bushland, Tex.
For primary bibliographic entry see Field 3E
W76-04296

AUSTRALIA DAMS AND STORAGES.
Department of Minerals and Energy, C
(Australia). Div. of National Mapping.
For primary bibliographic entry see Field 7C
W76-04307

ANALYSIS AND SYNTHESIS OF FLOOI TROL MEASURES,
Colorado State Univ., Fort Collins. Dept.
Engineering.
Hydrology Papers, No 76, September 197
25 fig, 32 tab, 88 ref, 6 append.

Descriptors: *Flood control, Physical
*Flood plain insurance, *Flood fore
*Flood plain zoning, Channel impro
Reservoir storage, Systems analysis, E
feasibility, Optimization, Computer p
Planning.
Identifiers: *Arkansas River(Colo), Chenery input-output model, Flood planning.

By an approach of analysis and synthes control planning becomes more meaningfu present and future flood control m methodology was developed which inco four structural parts: (1) classification control measures, (2) performance an classified measures, (3) subsequent syn various mixes of measures in order to optimal mix, and (4) impact of proposed on regional economy. Analysis of nons measures, especially land use and insur mands a common yardstick in measuring benefits comparable to those of structu sures. The methodology presented h tempted to incorporate the difficult probl terdependence of flood control measu methodology of analysis and synthesis sures was tested on the Arkansas River Basin, above John Martin Dam in Colo

ic synthesis of this method would enable a to examine the adverse effects of project l. Sociological, environmental, and sedi- images are potential factors in addition to lood damage. The Isard-Chenery regional itput model could be applied to planning of ntrol measures in a comprehensive and ex- manner, by making the hydrology- ics linkage a synthesis of flood control and economic performance. (Singh-ISWS) 308

SIS OF DROUGHT CHARACTERISTICS THEORY OF RUNS,
o State Univ., Fort Collins. Dept. of Civil ring.
ary bibliographic entry see Field 2E. 10

ATIONS OF MICROWAVES TO E SENSING OF TERRAIN,
tric Technology, Inc., Wakefield, Mass.
ary bibliographic entry see Field 7B. 14

AEROSPACE PHOTOGRAPHS TO STING AND CALCULATING FLOWS,
ary bibliographic entry see Field 7B. 25

UN-OFF CONTROL,
rtvelisvili.
from the National Technical Informa- ice, Springfield, Va 22161 as TT73-58029, aper copy, $2.25 in microfiche. Technical n TT 73-58029, 1974. 211 p, 60 fig, 9 tab, Translation of 'Regulirovanie-recnogo Gidrometeorologiceskoe-Izdatel'stvo, l (USSR), 1970. Translated for Bureau of ion, Washington, D.C.

rs: *Runoff, Water manage- lied), *Impoundments, *Hydroelectric werplants, Sedimentation, Water pollu- ers, Streamflow, Dams, Reservoirs, , Monte Carlo method, Stochastic Markov processes.
: *Runoff control theory, *USSR.

graph concerned a theory of river-ru- ol in the present conditions of the in- tilization of water. The main emphasis d on the water economy pattern and e characteristics of its components. n was given of the use of mathematical nd computers in the subject, which may optimum operating conditions for the nt of hydroelectric stations and other in- The publication will prove valuable to ts and designers in hydraulic engineer- as to workers in the field. Students and ates will also find the book useful. S)

DY OF A HYDROELECTRIC DAM: EY-LINCOLN SCHOOL PROJECT,
etts Inst. of Tech., Cambridge. Civil Program.
bibliographic entry see Field 6G.

LOOD PLAIN ZONING ORDINANCE L UNITS OF GOVERNMENT.
Dept. of Natural Resources, St. Paul. unicipalities, Association of Cities.
bibliographic entry see Field 6F.

FLOOD PLAIN MANAGEMENT FOR OREGON CITIES AND COUNTIES.
Oregon Univ., Eugene. Bureau of Governmental Research and Service.
For primary bibliographic entry see Field 6F.
W76-04357

ORDINANCE TO AMEND THE BUILDING CODE OF THE CITY OF GILLETTE, WYOMING.
For primary bibliographic entry see Field 6F.
W76-04358

AN ORDINANCE RELATING TO FLOOD PLAIN MANAGEMENT.
For primary bibliographic entry see Field 6F.
W76-04359

MINIMUM REQUIREMENTS FOR FLOOD CONTROL.
For primary bibliographic entry see Field 6F.
W76-04360

FLOOD PLAIN MANAGEMENT -- FPM-1 AND FLOOD INSURANCE PROGRAM.
Indiana Dept. of Natural Resources, Indianapolis.
For primary bibliographic entry see Field 6F.
W76-04361

MODEL FLOODWAY ORDINANCE (FLOODWAY REGULATION).
North Carolina General Assembly, Raleigh.
For primary bibliographic entry see Field 6F.
W76-04362

PROPOSED FLOOD DISTRICT ORDINANCE.
For primary bibliographic entry see Field 6F.
W76-04363

FLOOD HAZARD REGULATIONS (AMENDMENT TO THE BUILDING CODE).
For primary bibliographic entry see Field 6F.
W76-04364

INLAND WETLANDS: TECHNICAL DEFINITIONS DIRECTED TOWARD EMERGING POLICY ALTERNATIVES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W76-04389

GRAPHIC AND TABULAR SUMMARIES OF WATER AND SUSPENDED-SEDIMENT DISCHARGE DURING EIGHT PERIODS OF SYNOPTIC STORM SAMPLING IN THE LOWER DRAINAGE BASIN OF REDWOOD CREEK, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-04398

A SURVEY OF THE WATER RESOURCES OF ST. CROIX, VIRGIN ISLANDS,
Geologic Survey of Puerto Rico, San Juan.
D. G. Jordan.
Open-file report (Caribbean District), 1975. 51 p, 29 fig, 6 tab, 17 ref.

Descriptors: *Water resources, *Hydrology, *Surface waters, *Groundwater resources, *Virgin Islands, Hydrologic data, Rainfall, Streamflow, Runoff, Hydrogeology, Water yield, Groundwater recharge, Water quality, Water analysis, Chemical analysis.
Identifiers: *St Croix(V I).

St. Croix, Virgin Islands, consists of two mountainous volcanic rock cores separated by a graben containing clays with minor limestone and conglomerate that is overlain by about 300 ft of marl and limestone. Rainfall ranges from about 30 in. in eastern St. Croix to 55 in. in the northwestern mountains. Four streams, all heading in the Northside Range, have intermittent reaches. All other streams are ephemeral, flowing only for a few hours or days following major rainstorms. Flow in the intermittent streams ranges from about 1 to 9 percent of the total rainfall and usually half or more of the flow is storm runoff resulting from two or three major storms. Water in the volcanic rocks is basically a calcium bicarbonate sodium chloride type with dissolved solids ranging from 500 to 1,000 mg/litre, and chloride concentration of 100 to 300 mg/litre. By contrast, water in the limestone is a sodium bicarbonate sodium chloride type with dissolved-solids content ranging from less than 1,000 to more than 20,000 mg/litre and chloride concentration from less than 100 to more than 10,000 mg/litre. The groundwater potential (equivalent to the quantity of recharge) of St. Croix is estimated at 3.9 mgd. (Woodard-USGS)
W76-04399

MINERAL AND WATER RESOURCES OF SOUTH DAKOTA.
Geological Survey, Reston, Va.
Cooperative Report to the Committee on Interior and Insular Affairs, United States Senate, 94th Congress, 1st Session: Washington, U.S. Government Printing Office, 1975. 313 p, 51 fig, 47 tab, 256 ref.

Descriptors: *Water resources, *Mineralogy, *Natural resources, *South Dakota, Reviews, Hydrology, Water supply, Water demand, Available water, Surface waters, Groundwater, Water utilization, Water resources development, Evaluation, Publications, Bibliographies.
Identifiers: *Mineral resources(S Dak).

The fundamentals of the geology of the State of South Dakota are discussed in the detail necessary as background for mineral and water resources appraisals. References to thousands of pages of publications and many maps are included. The mineral deposits are discussed in three categories: (1) metallic minerals, (2) nonmetallic minerals, which also are commonly referred to as industrial minerals and rocks, and (3) the mineral energy sources. An important aspect in the understanding of the water resources is an accurate appraisal of their utilization and degree of development. A water use study by the U.S. Geological Survey for the year 1970 reveals a marked difference in water use practices between the glaciated area east of the Missouri River and the unglaciated area west of the river. On a statewide basis, of the total water withdrawn, irrigation requires 51 percent; farm-domestic purposes, 27 percent; and municipalities and industry 22 percent. Of the 453 million gallons per day withdrawn, surface waters supply 55 percent and groundwater sources furnish 45 percent. (Woodard-USGS)
W76-04400

SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1974,
Geological Survey, Tallahassee, Fla.
H. J. McCoy.
Open-file report FL-75007, 1975. 103 p, 11 fig, 12 ref.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *Water quality, *Florida, Basic collections, *Streamflow, Flow rates, Gaging stations, Water wells, Water level fluctuations, Chemical analysis, Water analysis, Inorganic compounds, Organic compounds, Pesticides, Aquifers.
Identifiers: Collier County(Fla).

Streamflow and water-level fluctuations in Collier County, Fla., are grabbed for the 1974 water year (October 1973 to September 1974). Water-quality data are presented in table, graph, and diagram forms for their periods of record. Changes in hydrologic conditions are monitored by a data-collection network mainly in the western half of the county but in greater detail in the urbanized Naples area. The county-wide network consists of 4 streamflow gaging stations (plus 1 station not in network), 16 wells equipped with continuous water-level recorders, 32 wells samples semi-annually for chloride analyses, and 15 surface-water sites sampled semi-annually for nutrient analyses. The Naples network consists of 1 streamflow gaging station, 3 wells equipped with continuous water-level recorders, 91 wells sampled or measured semi-annually for chloride analyses or water-level fluctuations, and 4 surface-water sites sampled quarterly for analysis of chemical, physical, and bacteriological parameters. Data from Naples network are used to prepare water-table contour maps of the municipal well field area near the end of the dry season (May) and the wet season (October). (Woodard-USGS)
W76-04403

FLOW-DURATION AND LOW-FLOW FREQUENCY DETERMINATIONS OF SELECTED ARKANSAS STREAMS,
Geological Survey, Little Rock, Ark.
M. S. Hines.
Arkansas Geological Commission, Little Rock, Water Resources Circular No 12, 1975. 75 p, 7 fig, 3 tab, 25 ref, append.

Descriptors: *Hydrologic data, *Streamflow, *Flow duration, *Low-flow frequency, *Arkansas, Natural flow, Regulated flow, Flow measurement, Gaging stations, On-site data collections, Estimating, Flow rates, Methodology.

Analysis of regulated and unregulated streamflow records in Arkansas provides flow duration and low-flow frequency data for 290 sites, consisting of complete duration and low-flow frequency distribution at 107 continuous-record gaging stations and abbreviated information at 183 partial-record stations. Low-flow yield is closely associated with physiographic characteristics. Useful low-flow duration and frequency information can be estimated by comparing several discharge-measurement results with concurrent daily mean flow for appropriate gaging stations. A combination of mathematical and graphical methods of analysis provides the best determinations of flow duration and low-flow frequency. (Woodard-USGS)
W76-04406

MAGNITUDE AND FREQUENCY OF FLOODS IN SMALL DRAINAGE BASINS IN NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
O. A. Crosby.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 480, $4.00 in paper copy, $2.25 in microfiche. Water-Resources Investigations 19-27, May 1975. 24 p, 2 plates, 7 fig, 2 tab, 17 ref.

Descriptors: *Flood forecasting, *Peak discharge, *Small watersheds, *Streamflow, *North Dakota, Hydrology, Flood frequency, Model studies, Regression analysis, Gaging stations, Flood control, Topography, Runoff, Infiltration, Climatic data.
Identifiers: *Ungaged sites.

Methods are presented for estimating flood-peak discharges at 2- to 50-year recurrence intervals on North Dakota streams draining less than 100 square miles (259 square kilometres). For gaged sites, frequency estimates are provided directly. For ungaged sites, the method relates drainage area and(or) soil-infiltration index to peak discharges. The equations presented are for sites on streams with natural flow and are not applicable to urban areas or basins affected by man-made regulation. Information is also provided on the maximum flood magnitude experienced. (Woodard-USGS)
W76-04410

AMENDING THE WILD AND SCENIC RIVERS ACT.
For primary bibliographic entry see Field 6E.
W76-04437

MODIFYING SECTION 204 OF THE FLOODING CONTROL ACT OF 1965.
For primary bibliographic entry see Field 6E.
W76-04438

CIVIL WORKS PROJECTS: LAKESHORE MANAGEMENT.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-04450

AN ORDINANCE REGULATING THE USE OF FLOOD PLAIN AREAS.
Palatine, Illinois, Ordinance No 0-1-74 (1973), 7 p.

Descriptors: *Illinois, *Flood plains, *Water levels, *Flood damage, *Runoff, Storm water, Flood, Recreation, Sewage treatment, Parks, Hunting, Fishing, Structures, Buildings, Retaining walls, Culverts, Bridges, Concrete construction, Dams, Reservoirs, Application methods, Topographic mapping, Permits.
Identifiers: Palatine(Ill), *Flood base elevation, Developments, Accumulation, Pool elevation, Sanitary landfills, Density transfers.

In order to protect against flood damage, all lands deemed to be in the flood plain, as defined by this ordinance, and all lands adjacent to the flood plain and less than one foot above the level of the flood base elevation shall be permitted to be used for such purposes as recreation, wildlife sanctuaries, nurseries, orchards, outlet installations for sewage treatment plants, and utility transmission lines. Other specified uses can be made of such lands with the approval of the Village President and Board of Trustees; however, other designated uses, such as for most structures and buildings, are absolutely prohibited. If lands adjacent to the flood plain and less than one foot above the level of the flood base elevation are filled and the elevation thereof raised to one foot or more above the flood base elevation, buildings and structures can be constructed within such areas only when certain specified conditions are met. Flood Plain Areas may be utilized in calculating floor area or lot size density for an entire tract of land only in accordance with the conditions set forth in this ordinance. (Segall-Florida)
W76-04475

4B. Groundwater Management

RESPONSE TO TIDES OF COASTAL AQUIFERS: ANALOG SIMULATION VS. FIELD OBSERVATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W76-04002

GEOTHERMAL WATER RESOURCES IN ARIZONA: FEASIBILITY STUDY,
Arizona Univ., Tucson. Dept. of Geosciences.
D. Norton, T. Gerlach, K. J. De Cook, and J. S. Sumner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 475, $5.00 in paper copy, $2.25 in microfiche. Completion Report, August 1975. 49 p, 17 fig, 13 ta ref, append. OWRT A-054-ARIZ(2). 14-31-5003.

Descriptors: *Geothermal studies, *Er *Thermal water, *Arizona, Feasibility studie
Identifiers: *Hydrothermal systems, Hot dry Magma tap, Thermal energy.

Conventional geothermal water resource Arizona are apparently limited to an eas trending belt about 100 miles wide with Basin-Range province of Arizona and close lowing the Gila River. Hot-dry rock and m tap types of geothermal energy may al present within this zone as well as outside it example, in the Flagstaff area. Numerous and springs with temperatures greater than 3 found within the 100 mile-wide zone, and monly their locations are coincident with features described by ERTS photographs. cation of geochemical geothermometers to waters yields predicted reservoir temperatu to 150C, although Tellier (1973) reports va to 300 C for waters from this region. We core, and outcroppings of basin fill deposits ford Basin suggest that thermal waters a tained in coarse sand and conglomeratic b reservoirs and possibly in lava flows a deposits under the sediments which fill th Shallow lacustrine deposits of evaporit clays probably function as cap rocks in t preventing mixing of warm deeper wate cooler surface waters. Igneous rocks recent age are consistently found within t containing the thermal waters. These represent the most probable source of energy, although in Safford Basin he originate from exothermic hydration reac anhydrite in lacustrine evaporite deposits.
W76-04005

GRAPHICAL CALCULATION OF A TRANSMISSIVITIES IN NORTHERN BURY, NEW ZEALAND,
Cantebury Univ., Christchurch (New Z Dept. of Civil Engineering.
For primary bibliographic entry see Field
W76-04102

DRAWDOWN SOLUTIONS FOR SIMU OUS DRAINAGE AND ET,
North Carolina State Univ., Raleigh. Biological and Agricultural Engineering.
R. W. Skaggs.
Journal of the Irrigation and Drainage American Society of Civil Engineers, Vo IR4, Proceedings Paper 11804. p December 1975. 9 fig, 16 ref, 2 append.

Descriptors: *Drainage, *Seepage, *Evapotranspiration, *Water table, S drainage, Ditches, Drawdown, Subsurfa Tiles, Drainage effects, Numerical Graphical methods, Deep percolation Forchheimer theory, Groundwater m Soil water movement, Hydraulic conduct
Identifiers: *Drain spacing, *Water ta down, Deep seepage, Boussinesq equatio

Numerical methods were used to solve linear Boussinesq equation for water t down between parallel drains. The solu compared to other methods of predict down for initially horizontal, parabolic, cal profiles, and good agreement was f methods that considered the nonlinear the governing equation. Solutions were in graphical form for simultaneous dr ET or deep seepage. Example probl solved to show the use of these sol evaluating the effect of ET or deep s water table drawdown and for consider fect when predicting drain spacings t predetermined drawdown rate. The solu also used in an example to explain appa

ies in field tests of drain spacing equations.
derson-ISWS)
04103

ROGEOLOGICAL STUDY OF THE SEL-
K AREA, MANITOBA,
rtment of the Environment, Ottawa
rio). Water Resources Branch; and Depart-
of the Environment, Ottawa (Ontario). In-
Water Directorate.
Charron.
tific Series No 8, 1974. 40 p, 38 fig, 6 tab, 12

riptors: *Hydrogeology, *Groundwater,
er wells, *Water quality, Census, Aquifers,
flow, Potable water, Reserve osmosis, Dye
rsion, Fluorescent dye, Gases, Carbon diox-
Atmospheric pressure, Artificial recharge,
tiometric level, Hardness(Water), *Canada.
fiers: Hydrogeochemistry, *Red River Val-
anitoba).

ist six groundwater studies in the Red River
, Manitoba, is described. The study consist-
ainly of a well inventory of over 3,000 wells
Selkirk map area, was carried out during the
ers of 1964 and 1965. The groundwater yield
various aquifers is described both quantita-
and qualitatively. In the Selkirk map area,
is evidence of a more abundant supply of
dwater of good quality than exists in any of
ner areas in the Red River Valley studied by
thor. A description is included of an area in
gas exhalations (mainly CO2) occur with
on in barometric pressure. As the ground-
of this area has a lower than normal
netric surface, the possibility of artificial
ge exists. (Environment Canada)
4162

RAM FRONT, TWO - DIMENSIONAL
LATION OF A MOVING INTRUSION
T IN A THIN HORIZONTAL CONFINED
FER,
ment of the Environment, Ottawa
io). Water Resources Branch; and Depar-
of the Environment, Ottawa (Ontario). In-
aters Directorate.
mary bibliographic entry see Field 7C.
4172

RAM TEBES, TRANSMISSIVITY,
AGE FACTOR AND STORATIVITY
A LEAST SQUARES FIT OF RESIDUAL
DOWN,
ment of the Environment, Ottawa
o). Water Resources Branch; and Depart-
f the Environment, Ottawa (Ontario). In-
aters Directorate.
mary bibliographic entry see Field 7C.
181

OF GROUNDWATER FLOW IN RUS-
OUNTY, ONTARIO,
nent of the Environment, Ottawa
o). Water Resources Branch; and Depart-
the Environ,ent, Ottawa (Ontario). Inland
Directorate.
arron.
ic Series No 40, 1974, 26 p, 31 fig, 3 tab, 11

tors: *Groundwater, Flow, *Water quali-
undwater basins, Wells, Water yield,
a, *Base flow.
ers: *Groundwater yield, Russell County,
o, Sulphate reduction, Topographic data,
cal data, Hydrogeochemical data, Ground-
ow, Recharge areas, Chloride bicarbonate
pe, Groundwater quantity.

rage groundwater yield of the wells in Rus-
nty is less than 10 gpm. Good potable groundwater is found in the county, but the quality in many areas leaves much to be desired because of a relatively high hydrogen sulfide or sodium chloride content. The predominant modifying phenomenon is sulfide reduction. Although it provides hydrogen sulfide, it also increases the carbon dioxide content of the groundwater. The latter makes the groundwater chemically active throughtout its entire flow. There is relatively large increase in the chloride value of the groundwater outside the recharge areas. By using topographic, geological and hydrogeochemical data, the directions of groundwater flow throughout Russell County have been indicated. These flows can be described as follows: a main eastward flow; flow into channels of the Champlain Sea; flow towards the Ottawa River; and flow from the west ending at Mer Bleue, with a high observed total dissolved solids value of 106,985 parts per million possibly owing to the effects of a shale aquiclude. The bedrock topography controls groundwater flow. It separates fresh and saline groundwater. The bedrock channels seem to guide the main eastward groundwater flow towards Alfred Bog in Prescott County. Vertical zonation of the groundwater exists, as shown by the fresh water floating on salty water. Finally, the groundwater can be said to evolve from a bicarbonate type of water in the recharge areas through a base exchange and sulfate reduction stage to become a chloride-bicarbonate type of water. (Environmental Canada)
W76-04237

GROUND WATER LAW: PROBLEM AREAS,
Arizona Univ., Tucson. Coll of Law.
R. E. Clark.
Natural Resources Lawyer, Vol 8, No 2, p 377-90, (1975). 14 p.

Descriptors: *Water resources development, *Aquifer management, *Water supply, *Groundwater, *Surface groundwater relationships, Management, Administration, Surface waters, Natural resources, Water quality, Recharge, Energy, Reasonable use, Streams, Pumps, Underground streams, Wells, Beneficial use, Prior appropriation, Flooding, Reservoirs, Conservation, Agriculture, Groundwater mining.
Identifiers: *Water depletion, Correlative rights.

There are many areas in which the law should provide improved procedures for the management of ground water and water resource generally. Carefully planned legislation rather than hurried amendments are needed. The three principal problems of ground water law, management, and administration are: (1) integrating management of surface water and ground water; (2) depletion of ground water aquifers at rates exceeding recharge; (3) and impairment of ground water quality. The National Water Commission has made nine recommendations which relate to management of surface and ground water sources and the depletion of aquifers. These proposals deserve attention because of the ad hoc development of ground water law to date. The four ground water theories that have emerged in the United States are discussed. They are the common law right of unlimited withdrawal from beneath one's land, the reasonable use rule, the correlative rights rule, and the prior appropriation doctrine as modified by individual states. Most ground water law has emerged in the past forty years. What is needed now is legislation that looks to the total supply of surface and ground water sources. (Seagall-Florida)
W76-04334

KANSAS UNDERGROUND STORAGE REGULATIONS.
Kansas State Board of Health, Topeka.
For primary bibliographic entry see Field 5G.
W76-04377

PRELIMINARY INVESTIGATION OF GROUND-WATER QUALITY AND ITS EFFECT ON SUBURBAN DEVELOPMENT IN WASHOE VALLEY, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5A.
W76-04386

WATER-LEVEL RECORDS FOR COLORADO, 1971-75,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-04394

WATER-QUALITY DATA FROM OIL AND GAS WELLS IN PART OF THE PERMIAN BASIN, SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-04395

INTERPRETATION OF GEOLOGIC AND HYDROLOGIC DATA FROM THE RAY-1 WELL, CITY OF GALLUP, MCKINLEY COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
W. L. Hiss, and J. G. Marshall.
Open-file report 75-573, November 1975. 58 p, 3 fig, 1 tab, 4 ref.

Descriptors: *Well data, *Drilling, *Geology, *Lithologic logs, *New Mexico, Petrology, Geomorphology, Well casings, Collapse, Water yield, Forecasting.
Identifiers: *Gallup(N Mex).

The Ray-1 well was to be the third production well completed in the city of Gallup, N. Mex., Yah-ta-hey well field located about 7 miles (11 km) north of the city. The first string of casing collapsed during completion, however, and the well was abandoned before it could be tested. The lithology of the Upper Cretaceous Dalton Sandstone and Dilco Coal Members of the Crevasse Canyon Formation and the Gallup Sandstone was interpreted from geophysical logs and examination of the drill cuttings. These units appear to be similar to correlative strata encountered in the first two wells. A yield of approximately 700 gpm, similar to the other wells in the Yah-ta-hey well field, is anticipated from the same aquifers when the Ray-1 replacement well is completed. (Woodard-USGS)
W76-04396

A SURVEY OF THE WATER RESOURCES OF ST. CROIX, VIRGIN ISLANDS,
Geologic Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 4A.
W76-04399

MINERAL AND WATER RESOURCES OF SOUTH DAKOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-04400

SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-04403

EFFECTS OF A LANDFILL OPERATION ON GROUND-WATER QUALITY IN NORTH BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-04404

POTENTIOMETRIC SURFACE AND AREAS OF ARTESIAN FLOW OF THE FLORIDIAN AQUIFER IN FLORIDA, MAY 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-04405

COCKEYSVILLE QUADRANGLE: GEOLOGY, HYDROLOGY AND MINERAL RESOURCES,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 7C.
W76-04407

GROUND-WATER RESOURCES OF WAUKESHA COUNTY, WISCONSIN,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2F.
W76-04408

DIGITAL MODEL SIMULATION OF THE GLACIAL-OUTWASH AQUIFER AT DAYTON, OHIO.
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 2F.
W76-04409

UNITED STATES GEOLOGICAL SURVEY'S HYDROGEOLOGICAL RESEARCH PROGRAMS AND PLANS RELATED TO DISPOSAL OF RADIOACTIVE WASTE INTO GEOLOGIC FORMATIONS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W76-04411

TREATMENT AND DISPOSAL OF ANIMAL WASTES IN MASSACHUSETTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5D.
W76-04418

4C. Effects On Water Of Man's Non-Water Activities

HYDROLOGIC DATA SUMMARY: CLEARWATER RIVER BASIN, WATER YEAR 1973-1974,
Washington Univ., Seattle. Coll. of Forest Resources.
D. D. Wooldridge, A. G. Larson, and A. R. Wald.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 494, $4.50 in paper copy, $2.25 in microfiche. Washington Water Research Center, Pullman, Completion Report, June 1, 1975. 62 p, 1 fig, 58 tab, 2 ref. OWRT A-059-WASH(1). 14-31-0001-4048.

Descriptors: Water quality, Sediments, Suspended solids, *Hydrologic data, Data collections, *Streamflow, *Washington, Forest management, Land management, *Sediment yield, Fish.
Identifiers: Forest water yield, *Clearwater River Basin(Wash).

Research was conducted on the effects of certain forest land management practices on migratory fish in the Clearwater River Basin of the western Olympics. An understanding of the dynamics of stream flow and water quality is necessary to interpret the results of many phases of the fisheries studies. Data are presented in tabular form for mean daily flow in cubic feet per second and concentrations of suspended sediment. Total monthly discharge and sediment yields were also calculated. Annual runoff ranged from a high 204 area inches for the 5.86 square mile Christmas Creek basin to a low of 77.4 for Hunt Creek (1.19 sq. mi.). Maximum instantaneous streamflow was 477 cubic feet per second per square mile (cfsm) from the 2.3 square mile Bull Creek Basin. Many basins had maximums of 200 to 250 cfsm with a value of 172 cfsm for the Upper Clearwater River (97.3 sq. mi.). Low flow for the same station was 1.02 cfsm. Lowest values recorded were .25 to .30 cfsm during August and September from small upper basins. Maximum suspended sediment concentrations varied from less than 100 to 696 milligrams per liter. Annual suspended sediment transport varied from about 100 tons per square mile to over 2000 tons per square mile.
W76-04019

AQUATIC SURVEY OF SELECTED STREAMS WITH CRITICAL HABITATS ON NATIONAL RESOURCES LANDS AFFECTED BY LIVESTOCK AND RECREATION,
Brigham Young Univ., Provo, Utah. Center for Health and Environmental Studies.
R. N. Winget, and M. K. Reichert.
Final report, Supported by Bureau of Land Management, January 6, 1976. 109 p, 37 tab, 11 fig, 3 ref. 52500-CT5-1104.

Descriptors: *Watershed management, *Benthos, *Stream improvement, *Water quality, *Coliforms, Bank stability, Land management, Grazing, Cutthroat trout, Streams, Aquatic habitats, Baseline studies, *Basic data collections, Surveys, Recreation, Livestock, *Environmental effects.
Identifiers: *Environmental Impact Evaluation, National Resource Lands, Critical aquatic habitat, *Grazing impacts, *Recreational impacts.

Surveys were conducted to provide aquatic habitat and water quality baseline data to the Bureau of Land Management to be used in evaluating (1) livestock grazing impacts on the flora and fauna of Big, Birch, Thoms, and Trout Creeks, and (2) impacts from recreational use on the potable water supply and aquatic ecosystem of Rock Creek. Included in the analyses are: descriptions of existing aquatic habitats; characterization of macroinvertebrate communities; and a water quality summary for each stream. The assemblage, analysis, and recommendations presented will form the basis of land/water management decisions and future studies involving aquatic habitats and related fauna in these Utah streams. Preliminary analyses indicate: riparian vegetation is probably one of the most critical factors of quality aquatic habitats in small mountain streams; and near optimum riffle to pool ratios are important as too many pools reduce macroinvertebrate diversity and density and too much riffle eliminates needed fish habitats. (BLM)
W76-04042

QUALITY OF WATER DISCHARGED FROM AN URBAN MOTORWAY,
Severn-Trent Water Authority, Birmingham (England). Dept. of Operations.
For primary bibliographic entry see Field 5B.
W76-04104

SPECIAL CHARACTERISTICS OF URBAN HYDROLOGY,
American Society of Civil Engineers, Marblehead, Mass. Urban Water Resources Research Progeam.
For primary bibliographic entry see Field 2A.
W76-04138

CATCHMENT MODELS FOR URBAN AREAS,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 2A.
W76-04139

PREDICTING PROFILES OF SNOWDRIFTS IN TOPOGRAPHIC CATCHMENTS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-04288

LEGAL PROBLEMS INVOLVED IN DEVE ING WATER SUPPLIES FOR ENE DEVELOPMENT,
Debevoise and Liberman, Washington, D.C.
For primary bibliographic entry see Field 3E.
W76-04336

WATER DEMANDS FOR ENERGY DEVE MENT,
New Mexico Univ., Albuquerque. Dep Economics.
For primary bibliographic entry see Field 6D
W76-04337

4D. Watershed Protection

ANALYSIS OF THE SEDIMENT FILTR ACTION OF GRASSED MEDIA,
Kentucky Water Resources Research Inst ington.
B. J. Barfield, and D. T. Y. Kao.
Available from the National Technical In tion Service, Springfield, Va 22161 as PB-2 $4.50 in paper copy, $2.25 in microfiche. R Report No 90, December 1975. 50 p, 14 fig 19 ref. OWRT A-049-KY(1). 14-31-0001-4 31-0001-5017.

Descriptors: *Sediment transport, *Erosi trol, Suspended load, Bed load, Turb Grassed waterways, Sediment yield, *Tr ciency, Filtration, Filters, Open chann Model studies.
Identifiers: Grass filters, Turbulent hyd Gaf method, Einstein method.

The movement of sediment in non-sub flow through a rigid grass media was stu perimentally by simulating the media with cal nails. Models of sediment moveme developed from probabilistic reasoning a the use of existing parameters describing material in open channel flow. In the pr analysis, the percent sediment trapped w to be a power function of the number of fall paths, Nf, a particle could make from face to the bed while traveling through media. The percent trapped was also fou an inverse power function of the Reynold ReT. The characteristic length used Reynolds number was a hydraulic radi lated assuming rectangular open channel a width equal to the spacing between elem a depth equal to the depth of flow. This i as the spacing hydraulic radius, Rs. Th trapped was finally related exponentially bined power function of Nf and ReT: material transport functions of Graf and were modified and evaluated as pred suspended and bed load. Bed shear was to be equal to gamma RsS where gam weight density of water and S is chan Both Graf's and Einstein's parameters w to be good predictors of suspended and (Huffsey-Kentucky)
W76-04009

PREDICTION IN CATCHMENT HYDR
Australian Academy of Science, Cambe
For primary bibliographic entry see Fiel
W76-04128

TRANSPORT OF MATERIALS IN STR
Melbourne Univ., Parkville (Australia) Civil Engineering.
For primary bibliographic entry see Fiel
W76-04136

USE OF PHYSICAL PROCESS MODE
Commonwealth Scientific and Industri Organization, Canberra (Australia). Di Industry.
For primary bibliographic entry see Fiel

4140

RATION OF THE STATE WATER NING MODEL FOR SUB-BASIN 42-KJ OF ELLOWSTONE RIVER BASIN,
na State Univ., Bozeman. Dept. of Civil En-ng and Engineering Mechanics.
mary bibliographic entry see Field 4A.
4232

ENT DATA - CANADIAN RIVERS 1971.
ment of the Environment, Ottawa o). Water Resources Branch; and Depart-f the Environment, Ottawa (Ontario). Ap-ydrology Div.; and Department of the En-ent, Ottawa (Ontario). Inland Waters rate.
nary bibliographic entry see Field 7C.
251

EEDS FOR WATER QUALITY MODELS RICULTURAL WATERSHEDS,
ist Environmental Research Lab., Athens,

nary bibliographic entry see Field 5B.
353

ATER QUALITY ANAGEMENT AND OTECTION

dentification Of Pollutants

Y OF CONTINUOUS WATER QUALITY ORING SYSTEMS,
ee Univ., Knoxville. Dept. of Civil En-g.
rson.
e from the National Technical Informa-vice, Springfield, Va 22161 as PB-249 502, paper copy, $2.25 in microfiche. Tennes-er Resources Research Center, Knoxville, No 45, October, 1975. 86 p, 10 tab, 11 fig. A-022-TENN(3). 14-31-0001-3843.

ors: Water quality, *Monitoring, *Data ns, *Instrumentation, *Measurement, systems, Tennessee, Impoundments, t identification.

nuous water quality robot monitoring was evaluated. This report presents a on of the State of the Art, the system oratory and field performance testing of pment. Also included are studies on ity, economy, efficiency, portability, and of the system on a Tennessee Valley impoundment in East Tennessee. Data hat a continuous water quality monitor-m can provide relevant information for ater quality study.
06

AND DISTRIBUTION OF TRACE IN FISH,
Univ., Lafayette, Ind. Dept. of nics.
ry bibliographic entry see Field 5C.
0

TUDY OF NON-POINT SOURCE POL-N VIRGINIA,
Polytechnic Inst. of and State Univ., g. Dept. of Civil Engineering.
ry bibliographic entry see Field 5B.

STUDIES ON THE EFFECTS OF THERMAL ADDITIONS ON SELECTED ZOOPLANKTON POPULATIONS,
Minnesota Univ., Duluth. School of Medicine.
For primary bibliographic entry see Field 5C.
W76-04012

CHEMICAL COMPOSITION OF SNOW IN THE EAST CENTRAL SIERRA NEVADA,
Max C. Fleishmann Coll. of Agriculture, Reno, Nev.
For primary bibliographic entry see Field 2C.
W76-04018

WASTE WATER PROBLEMS OF DESIZING WITH RESPECT TO LEGISLATIVE MEASURES (ABWASSERPROBLEME BEIM ENTSCHLICHTEN UNTER BERUECKSICHTIGUNG GESETZGERBERISCHER MASSNAHMEN),
For primary bibliographic entry see Field 5D.
W76-04031

POLLUTION MEASUREMENT IN ELECTROPLATING (A PROPOS DE LA MESURE DE LA POLLUTION EN GALVANOPLASTIC),
J. Benezech, and R. Wilmotte.
Galvano Organo, No 457, p 665-667, 1975. 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Pollutants identification, Water analysis, Analytical techniques, Chemical oxygen demand, Biochemical oxygen demand, Bioassays, Toxicity.
Identifiers: Equitox units.

Standard and recommended methods for the measurement of water pollution in electroplating plants are presented. The suspended matter content of the waste waters is determined by simple weighing after filtration of centrifugation, while the oxidizable matter content is determined after 2-hr decantation through the measurement of the COD and BOD5 values. The soluble salt content is found by measuring the electrical conductivity in siemens/cm, and the value obtained is multiplied by the flow rate. Inhibiting substances are measured according to AFNOR T 90 301 standard, using Daphnia as a test organism in equitox units (one equitox quantity of the inhibiting substance per cu m being such that causes immobilization of 50 percent of the animals in 24 hr under standardized conditions). Such equitox values have been determined for copper (9,000), cadmium (2,800), chromium (1,350), sodium cyanide (670), aluminum (79), iron (41), sulfuric acid (37), Hydrochloric acid (39), nitric acid (20), ammonia (14), and tin (9). These values indicate that copper in waste water is 1,000 times more toxic than tin. All inhibiting substances are characterized by a specific water pollution coefficient by which the quantity of the substances purchased in one year is multiplied to obtain the number of equitox units per day. (Hamuth-FIRL)
W76-04038

A SIMPLE METHO DTHE FOR DETECTION OF FLOATING OILS ON WATER, (IN JAPAN),
Government Industrial Research Inst., Osaka (Japan).
K. Hagiwara, T. Tanaka, Y. Murakami, K. Hiiro, and A. Kawahara.
Japan Analyst, No 7, p 794-795, 1974. 1 fig, 2 tab.

Descriptors: *Oil wastes, *Oil spills, *Pollutant identification, *Polymers, Measurement, Photometry, Absorption, Oil pollution.
Identifiers: Japan, Floating oils.

Equipment for the detection of floating oils on water has been designed. This newly patented method is based on collection of the oils on a polymer film and photometric measurement of the light absorption in the visible region of the film adhered to the oils. Floating oil films a few microns in thickness on water adhere to a polymer film, such as polypropylene or polyvinyl chloride. Most common oils do not absorb light in the visible region. If a transparent film is used to collect the oils, the absorbance of the film at the visible region is not appreciably increased. However, if a translucent film is used to collect the oils, the film is clarified by adhesion of the oils. Detection of the floating oils on water is accomplished by measuring the absorbance of the translucent film in the visible region (650 nm). (Orr-FIRL)
W76-04062

IDENTIFICATION AND DETERMINATION OF 1,4-BENZOQUINONE IN WASTE WATER OF THE COAL WORKING INDUSTRY (ZUR IDENTIFIEZIERUNG UND BESTIMMUNG VON 1,4-BENZOCHINON IN ABWAESERN DER KOHLEVERARBEI- TENDEN INDUSTRIE),
H. Thielemann.
Wasser-und Abwasser-Forschung, Vol. 7, No. 3, p 91-93, 1974. 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pollutant identification, Chromatography, Chemical wastes, Toxicity.
Identifiers: 1,4-Benzoquinone, Thin-layer chromatography.

An identification and semiquantitative determination of 1,4-benzoquinone in waste water from the coal working industry is necessary because of its toxicological, hydrobiological, and chemical aspects. 1,4-Benzoquinone is a non-biodegradable toxic substance. The determination of it in these waste waters is performed by using a thin-layer chromatographic method. A sensitive spray-reagent for 1,4-benzoquinone is 4-aminoantipyrin in a two percent solution. (Kramer-FIRL)
W76-04074

HEAVY METAL POLLUTION IN THE SEDIMENTS OF THE COEUR D'ALENE RIVER DELTA,
Idaho Univ., Moscow. Dept. of Chemistry.
D. Maxfield, J. M. Rodriguez, M. Buettner, J. Davis, and L. Forbes.
Environmental Pollution, Vol. 7, No. 1, p 1-6, 1974. 5 fig, 1 tab, 4 ref.

Descriptors: *Path of pollutants, *Heavy metals, *Pollutant identification, Rivers, *Idaho, *Mining, Mine wastes, *Sediments, Cadmium, Lead, Copper, Silver, Zinc.
Identifiers: Antimony.

Data on distribution, extent and concentration of heavy metals in the sediments of the Coeur d'Alene River, Idaho, were obtained. The sediments collected were mostly fine silt typical of mine tailings. High concentrations of antimony, cadmium, copper, lead, silver, and zinc were present in the sediments. It appears that the metal content in the sediments deposited in recent years has been about the same. The variations in metal content of the different layers appeared to be related to the composition of the sediments. (Orr-FIRL)
W76-04091

AN AERIAL-PHOTOGRPHIC ANALYSIS OF THE ENVIRON'MENTAL IMPACT OF CLAY MINING IN NEW JERSEY,
Earth Satellite Corp., Washington, D.C. Geosciences and Environmental Applications Div.
D. Garofalo, and F. J. Wobber.
Photogrammetria, Vol. 30, No. 1, p 1-19, February, 1974. 10 fig, 5 tab, 4 ref.

Descriptors: *Mining, *Environmental effects, *Monitoring, *Pollutant identification, Costs, *Clay minerals, *New Jersey, Aerial photogaphy, Remote sensing, Water pollution effects.
Identifiers: *Surface clay mining.

An examination of surface clay mining in New Jersey has shown that black and white, color, and color-infrared aerial photography at 1:20,000 scale or larger can provide data for the monitoring of the environmental effects of surface mining. High-altitude color and color-infrared photography is an efficient technique for rapid statewide mining inventories or for studies of large surface mining operations. Color-infrared photographs are a graphic method for identifying the location of surface-mined areas and for determining the environmental impact upon vegetation. Analysis of natural color photographs yields information such as the color differences indicative of turbidity and general chemical quality. Aerial photographs are cost-effective and enable mineral development to continue with a better understanding of environmental consequences. (Orr-FIRL)
W76-04092

NAQUADAT USERS MANUAL,
Department of the Environment, Ottawa (Ontario). Water Quality Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W76-04156

HYDROGEOLOGICAL STUDY OF THE SELKIRK AREA, MANITOBA,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
For primary bibliographic entry see Field 4B.
W76-04162

INDUSTRIAL WATER RESOURCES OF CANADA; HUDSON BAY, LABRADOR AND ARCTIC DRAINAGE BASINS, 1959-1965,
Department of the Environment, Ottawa (Ontario). Water Quality Branch; and Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
For primary bibliographic entry see Field 3E.
W76-04163

REPORT FOR THE FISCAL YEAR 1972 - 1973: STUDY OF THE ST. LAWRENCE RIVER.
St. Lawrence River Working Group, Quebec.
For primary bibliographic entry see Field 4A.
W76-04166

WATER QUALITY DATA, BRITISH COLUMBIA 1961 - 71.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 7C.
W76-04171

EXPERIMENTAL BURNING OF WASTE OIL AS A FUEL IN CEMENT MANUFACTURE,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
E. E. Berry, L. P. MacDonald, and D. J. Skinner.
Technology Development Report, EPS 4-WP-75-1, June 1975. 187 p, 9 fig, 75 tab, 41 ref, 7 append.

Descriptors: *Oil pollution, *Oil wastes, *Fuels, *Cements, Lead, Zinc, Phosphorus, *Burning, Bromine, Solid wastes, Dusts, *Gases, *Air pollution effects.
Identifiers: Exhaust gases, By-pass system, Mass balance.

An experimental program was carried out at the St. Lawrence Cement Company Limited, Mississauga, Ontario, in which 330,000 gallons of used lubricating oil were burned as a portion of the total fuel requirement for a dry-process cement kiln. The system tested uses a dual four-stage preheater with a by-pass. The oil was primarily composed of automotive crankcase drainings and contained approximately .6 percent lead, .15 percent bromine, .1 percent zinc and .1 percent phosphorus. Lead, zinc and phosphorus emissions in the kiln exhaust gases were not increased during waste oil burning. A small reduction in particulate emissions was found during waste oil burning. A small increase in bromide emissions was also found. A material balance was carried out for Pb, Br, Zn, and P to confirm the emission data. It is indicated that these elements were retained in the process solids. Lead, zinc, phosphorus and some of the bromine were retained in the collected dust from the precipitator on the by-pass system. (Environment Canada)
W76-04177

MONITORING OF EFFLUENT STREAMS.
Food Technology, Vol 28, No 2, p 64, February, 1974.

Descriptors: *Food processing industry, *Industrial wastes, *Monitoring, *Oil wastes, *Pollutant identification, Adsorption, Effluents, *Effluent streams.
Identifiers: Dispersed Oil in Water Monitor(DOW), Ultraviolet light.

A method for monitoring effluent streams using a D.O.W. (Dispersed Oil in Water) Monitor was developed by C-E Invalco of Tulsa, Oklahoma. The principle of operation is that clean, clear water transmits UV light with very little absorption while most petroleum oils and their derivatives partially or completely absorb UV light. Variations in absorption therefore provide a sensitive and accurate determination of oil contained in water. The monitor's dual-beam-light measuring system continuously monitors the UV absorption rate in a stream. A continuous 30-day chart recorder registers oil content on a percent absorption basis. Detection range if 0-150 ppm, with accuracy of plus or minus 5 percent. The monitors operate with samples of up to 175 F and working pressures of 60 psig. (Murphy-FIRL)
W76-04187

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRIAN SHIELD LAKES OF NORTHWESTERN ONTARIO,
J. W. M. Rudd, and R. D. Hamilton.
J Fish Res Board Can, 30(10): 1537-1546, Illus, 1973.

Descriptors: *Phosphates, Lakes, *Canada, *Pollutant identification, Measurement, Chlorophyll, Seasonal, Primary productivity, Water pollution effects, Carbon.
Identifiers: *Precambrian Shield Lakes(Ontario), *Adenosine triphosphate.

Profiles of the ATP concentrations occurring in the particulate material of 2 experimental shield lakes were obtained with respect to time. Large seasonal changes were evident, as were specific sites of high biological activity due either to natural stratification or to deliberate manipulation. Chlorophyll a, particulate carbon and direct count data are misleading in specifying the changes or the sites of biological activity. Analysis of the ATP on the basis of the relative abundance of different size fractions is useful. An ATP filtration error could not be demonstrated, indicating that cell breakage is not a source of the filtration error inherent in some 14C primary and secondary productivity studies.--Copyright 1974, Biological Abstracts, Inc.
W76-04193

AN EVALUATION OF SQUOXIN ON INSECT DRIFT,
Idaho Univ., Moscow. Dept. of Entomology.
M. A. Brusven, and C. MacPhee.
Trans Am Fish Soc, 103(2): 362-365, 1974.

Descriptors: *Idaho, Rivers, Insects, Mayf
Sampling, Pollutant identification, Water pollu
sources.
Identifiers: Baetis-bicaudatus, Baetis-tricaud
Brachycentrus-sp, Cinygmula-sp, Epeorus
gimanus, Ephemerella-flavilinea, Ephemer
tibialis, Hydropsyche-sp, Trichoptera, *I
drift, *Squoxin, *St. Joe River(Idaho).

An analysis of 54 drift net samples obtained o
72-h period in riffle areas of the St. Joe R
Idaho, showed that a distributed concentrati
0.1 mg/(100ppb) of 1,1-methylenedi-2-naphth
a 13-h period cause no significant increase
sect drift during the sampling period. Eight sp
(Ephemerella flaviline, E. tibialis, Epeorus
gimanus Cinygmula sp., Baetis bicaudatu
Tricaudatus, Hydropsyche sp. and Brachyce
of insects in the orders Trichoptera
Ephemeroptera represented 87% of the tota
insects. All species drifted in greater abun
during the night.--Copyright 1974, Biologica
stracts, Inc.
W76-04206

GAS-EXCHANGE RATES IN A MALL LA
DETERMINED BY THE RADON METHOD
For primary bibliographic entry see Field 5B
W76-04219

STUDY OF GROUNDWATER FLOW IN
SELL COUNTY, ONTARIO,
Department of the Environment, (Ontario). Water Resources Branch; and I ment of the Environ,ent, Ottawa (Ontario). Waters Directorate.
For primary bibliographic entry see Field 4
W76-04237

LAND DISPOSAL OF SEWAGE SL
VOLUME II, (APRIL, 1973-MARCH, 1974
Guelph Univ. (Ontario). Dept. of Land R Science; and Guelph Univ. (Ontario). D Microbiology.
For primary bibliographic entry see Field 5
W76-04247

WATER QUALITY DATA, YUKON TE
RY 1961 - 1973.
Department of the Environment, (Ontario). Water Quality Branch; and Dep of the Environment, Ottawa (Pntario). Waters Directorate.
For primary bibliographic entry see Field 7
W76-04257

METHOD AND APPARATUS FOR MEA
SEWER SEDIMENTATION INFILT
AND FLOW,
E. Woo.
US Patent No 3,922,921, 4 p, 10 fig, 3 ref
Gazette of the United States Patent Of
941, No 1, p 80, December 2, 1975.

Descriptors: *Patents, *Sewerage, Sewage effluents, Flow, Conduits, Grou *Infiltration, Infiltration rates, *Sedim Measurement, Flow measurement, Inst tion, Gages, Water pollution control, identification.

A device for quick and economical mea of infiltration, sedimentation and liq through a sewer pipe is described. Infil ground water that enters sewer lines broken or defective pipes and loose join the capacity of sewer systems and treatm ties to hangle domestic and industr waters. Frequently, infiltration increa pollution and causes health hazards w water by-passes the treatment facilitie

s the sewer system. Waste water treatment of
ration requires larger treatment works with
ased costs. This apparatus does not require a
on to descend into a manhole because all mea-
ments are recorded on the surface. The ap-
us includes an enlongated probe which has an
gated tether member attached to the lower
on of the probe. A water buoyant float
ber is attached to the other end of the tether
ber and a vertically spaced sighting structure
pported from the probe at one side generally
lel to the probe. The float is tethered to a
p by means of an adjustable length flexible
r to be adjusted so as to have an effective
h greater than the elevation of the clamp
e the lower terminal end of the probe. The
is adjustable in effective length and a
actor is provided at the upper end of the
. (Sinha-OEIS)
04275

**AL CONTENTS OF LAKE SEDIMENT
ES FROM ESTABLISHED MINING
AS: AN INTERFACE OF EXPLORATION
ENVIRONMENTAL GEOCHEMISTRY,**
gical Survey of Canada Ottawa, (Ontario).
rce Geophysics and Geochemistry Div.
rimary bibliographic entry see Field 5B.
04291

**EFFECT OF CLIMATE ON THE CHEMIS-
OF CARBONATE GROUNDWATER,**
l Univ., Montreal (Quebec). Dept. of Geog-
.
rimary bibliographic entry see Field 2F.
04297

**ELINES ON SAMPLING AND STATISTI-
METHODOLOGIES FOR AMBIENT
CIDE MONITORING.**
al Working Group on Pest Management,
ngton, D.C.
ble from the National Technical Informa-
ervice, Springfield, Va 22161 as PB-239 798,
n paper copy, $2.25 in microfiche. Report,
er 1974. 61 p, 25 ref.

ptors: *Sampling, *Pesticides, *Monitoring,
odology, Air, Water, Soils, Estuaries, Fish,
e, Foods, Feeds, Human pathology, Pesti-
sidues, Environment, Environmental con-
Pollutant identification, Pollutants.

ring, as included in the National Pesiticide
ring Program, is defined as the repeated
g and analysis of components of the en-
ent to produce estimates of pesticide
levels in these components and the
s in these levels with time. This report was
designed for use by people with some
rity with field sampling operations although
cessarily with ambient sampling for pesti-
sidues. Such people will most likely be as-
d with a federal or state agency, university
private contractor involved with an exten-
nitoring program. The guidelines were or-
under these chapter headings: (1) statistics
dy design, (2) air, (3) soil, (4) the hydrologic
ment, (5) estuaries, (6) fresh water fish, (7)
, (8) food and feeds, and (9) human tissues.
procedures were suggested for each of
reas. The variability encountered in sam-
arious media from different geographical
and with different program objectives,
es the establishment of fixed methodolo-
ms-ISWS)
315

**MINARY INVESTIGATION OF
D-WATER QUALITY AND ITS EFFECT
BURBAN DEVELOPMENT IN WASHOE
Y, NEVADA,**
Univ., Reno. Desert Research Inst.
trong, and J. Fordham.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 801, $3.50 in paper copy, $2.25 in microfiche. Report of Progress, December 1975. Water Resources Center. 15 p, 3 fig, 6 tab, 1 ref, 2 append. OWRT A-065-NEV(1). 14-31-0001-5028.

Descriptors: *Nevada, Groundwater movement, *Chemical analysis, *Water quality, Water wells, *Flow rates, Streamflow, Data collections, *Fluorides, *Areal hydrogeology, Valleys, Watersheds(Basins), *Suburban areas, Urbanization.
Identifiers: Washoe Valley(Nev), *Groundwater quality.

In response to a severe water quality problem in the New Washoe City-Washoe Farms portion of the Washoe Valley, Nevada, a water quality study was initiated in November 1974. During the first year of study, 220 water samples were collected for chemical analysis from domestic wells and streams flowing into the valley. In addition, the rates of flow were measured, on a monthly basis, of inflowing streams. The study has yielded knowledge not previously available. This information is, however, subject to revision and refinement as the sampling program continues. The major points are: (1) Surface inflow may be eliminated as the direct source of contaminants in the ground water of the New Washoe City-Washoe Farms area. (2) A more accurate estimate of the volume of surface inflow to the valley than was previously possible, can now be made. (3) The areal occurrence of fluoride, which constitutes the major water quality problem, may be described as well as numerous other constituents of interest. (4) A relationship between well depth and fluoride concentration is now apparent. (5) The areal variations in ground-water quality may be described. (Fallon-Nevada)
W76-04386

CHEMICAL ANALYSIS AND PROCESS CLASSIFICATION OF CONSTITUENTS OF EFFLUENTS (ORGANIC NITROGEN IN ACTIVATED CARBON EFFLUENTS),
Connecticut Univ., Storrs. Inst. of Water Resources.
T. B. Helfgott.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 816, $3.50 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report, December 1975. 22 p, 2 fig, 3 tab, 4 ref. OWRT A-030-CONN(9). 14-31-0001-5007.

Descriptors: *Chemical analysis, *Nitrogen compounds, *Municipal wastes, *Amino acids, *Activated carbon, *Ion exchange, *Electrodialysis, *Waste water treatment, Environmental effects, Public health, Ozone, Biological treatment, *Pollution identification, Effluents.
Identifiers: Residual nitrogenous organics, Process response, Ozonation, Effluents of biological treatment.

The purpose is to characterize by process response and chemical analysis the residual organic constituents in waters, especially the nitrogen-bearing components of wastewater treatment effluents following biological treatment and advanced wastewater treatment steps such as the activated carbon process. Special real-time (quick instrumentation measurement) techniques have been developed to make precise, accurate and sensitive determinations necessary to measure nitrogen in its transient forms (from organic nitrogen to ammonia to nitrate) as the nitrogen passes through the several unit operations and processes necessary in wastewater treatment to remove nitrogenous organics. Research has shown that there are residual and refractory organics in municipal wastewaters as measured by total organic carbon (approximately 3 mg/l TOC), that are dispersed, are non-adsorbable onto activated carbon, are cationic at high pH (approximately 9-16) and resist ozonation degradation. The residual organics have been specifically identified as some basic amino acids - lysine, arginine and ornithine - in polypeptide form. These small, charged microcolloids can be removed from treatment water by processes that take advantage of the charge on these nitrogenous organics. The processes that can remove the polymeric forms of basic amino acids are ion exchange and electrodialysis. (de Lara-Connecticut)
W76-04387

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 4 AND 5. ST. LAWRENCE RIVER BASIN, AND HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-04392

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 7. LOWER MISSISSIPPI RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-04393

WATER-QUALITY DATA FROM OIL AND GAS WELLS IN PART OF THE PERMIAN BASIN, SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 7C.
W76-04395

A SURVEY OF THE WATER RESOURCES OF ST. CROIX, VIRGIN ISLANDS,
Geologic Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 4A.
W76-04399

SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-04403

GROUND-WATER RESOURCES OF WAUKESHA COUNTY, WISCONSIN,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2F.
W76-04408

CATTLE FEEDLOT WASTEWATER SALINITY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
T-F. Tsao.
MS Thesis, March 1972, 80 p, 15 fig, 19 tab, 44 ref.

Descriptors: *Farm wastes, *Feed lots, *Cattle, Waste water(Pollution), *Salinity, Agricultural runoff, Feeds, Nutrients, Sampling, Chemical analysis, *Pollutant identification, Water pollution sources.

Cattle manure samples from different feedlots with different salt concentrations in the feed were analyzed to determine how the salt concentration in the feed affects the salinity of the manure solution. Fresh manure samples from different pens of both university feedlots and commercial feedlots were collected for laboratory analysis. It was found that the more salt cattle feed contains, the higher is the specific conductance of the manure solution and the greater is the dissolved volatile and non-volatile solids content in the fresh manure. The logarithm of the sodium-adsorption-ratio of the one percent manure solution is proportional to the specific conductance of the solution. These facts demonstrate that the salt in cattle feed increase the water salinity problem of cattle feedlot runoff. (Cartmell-East Central)

W76-04429

FECAL COLIFORM POLLUTION IN AN AGRICULTURAL ENVIRONMENT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-04432

WATER QUALITY AND POLLUTANT SOURCE MONITORING.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-04444

5B. Sources Of Pollution

A CASE STUDY OF NON-POINT SOURCE POLLUTION IN VIRGINIA,
Virginia Polytechnic Inst. of and State Univ., Blacksburg. Dept. of Civil Engineering.
L. L. Harms, and E. V. Southerland.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 551, $4.50 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VPI-VWRRC-Bulletin 88, October 1975. 62 p, 9 fig, 7 tab, 39 ref. OWRT A-053-VA(2).

Descriptors: *Virginia, *Agricultural runoff, *Urban runoff, Sewage treatment, Treatment facilities, *Water pollution sources, Pollutant identification, *Organic matter, *Sediments, *Nutrients, Phosphorus, Algae, Path of pollutants.
Identifiers: *Non-point source, Pollution, *South River(Virginia).

Sources of organic matter, sediment, and nutrients were investigated for the Upper South River Basin near Waynesboro, Virginia. The study period extended from the end of April until mid-September, 1974, a total of 135 days. During the study period, 156 samples were collected with the following analytical determinations being made on each sample: chemical oxygen demand, total suspended solids, turbidity, specific conductance, total kjeldahl nitrogen, and nitrate. Flow measurements were also made at the sampling stations in order that total yields of materials could be established. Sources of organic matter, sediment and nutrients were agricultural, forest and urban land drainage in addition to domestic and industrial wastewater effluents. For each pound of phosphorus recorded in the river, about 10 pounds of nitrogen and 75 pounds of sediment were also present. Point sources accounted for an insignificant portion of the sediment, 2.1 percent, but were the major source of all other contaminants during the study. However, the point source contributions were overshadowed by non-point discharges during major storm events. Agricultural land drainage was a greater source of contamination than forest drainage. Urban runoff contributed substantial pollutant loads during runoff periods. The Waynesboro sewage treatment plant was the greatest source of phosphorus in the basin studied. Reduction of phosphorus in the Waynesboro sewage treatment plant effluent may reduce excessive algal production in the South River below Waynesboro.
W76-04011

OXIDATION OF LAKE AND IMPOUNDMENT HYPOLIMNIA,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W76-04016

CADMIUM-INDUCED HISTOPATHOLOGICAL CHANGES IN GOLDFISH,
For primary bibliographic entry see Field 5C.

W76-04043

VERTICAL EDDY DIFFUSION STUDIES IN THE THERMOCLINE OF A SMALL STRATIFIED LAKE,
R. Hesslein, and P. Quay.
J Fish Res Board Can. 30(10): 1491-1500. Illus. 1973.

Descriptors: Lakes, *Canada, *Thermal stratification, Eutrophication, *Thermocline, Epilimnion, *Diffusion, Eddies, Water pollution sources, Pollutant identification.
Identifiers: *Eddy diffusion, Radon method.

Values of K, the coefficient of vertical eddy diffusion in the thermocline of lake 227, a small, highly stratified, and artificially eutrophied lake in northwestern Ontario, Canada, are presented. Three methods: the classical temperature method of McEwen, a dye method and a new method using a Ragapos (Randon Gas Point Source), were used. Results ranged from 2 x 10-4 cm2/s by the Rn method to 34 x 10-4 cm2/s by temperature method; the dye method resulted in an average value of 12 x 10-4 cm2/s. The recycling of &CO2 resulting from particulate degradation below the epilimnion was calculated. The results ranged from 8-53% of the net loss of C from the epilimnion depending on the K value used. Results from the Rn method are considered more accurate than results from the temperature method.--Copyright 1974, Biological Abstracts, Inc.
W76-04082

HEAVY METAL POLLUTION IN THE SEDIMENTS OF THE COEUR D'ALENE RIVER DELTA,
Idaho Univ., Moscow. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-04091

PHYSICAL AND CHEMICAL CHARACTERISTICS OF GREAT BEAR LAKE, NORTHWEST TERRITORIES,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 2H.
W76-04095

NITROGEN MOVEMENT IN A SHALLOW AQUIFER SYSTEM OF THE NORTH CAROLINA COASTAL PLAIN,
Soil Conservation Service, Raleigh, N. C.
R. B. Daniels, J. W. Gilliam, E. E. Gamble, and R. W. Skaggs.
Water Resources Bulletin, Vol. 11, No. 6, p 1121-1130, December 1975. 4 fig, 1 tab, 3 ref.

Descriptors: *Nitrogen, Movement, *Aquifers, *Coastal plains, Water pollution, *Waste water disposal, *North Carolina, *Path of pollutants, Aquicludes, Groundwater, Porous media, Water table aquifers, Nitrates, Ammonium salts, Nitrites, Chemical wastes, Water pollution sources, Flow, Migration, Waste disposal, Waste storage, Industrial wastes, Groundwater movement.
Identifiers: *Shallow aquifers, Waste ponds, Chowan River(NC).

Concentrations of ammonium- and nitrate-nitrogen of about 10,000 ppm moved from an untreated surface storage pond into the groundwater in the sandy beds of the surficial sediments in northeastern North Carolina. This high concentration of nitrogen moved through the permeable sandy beds with the groundwater above the Yorktown Formation aquiclude to the Chowan River with only minor dispersion normal to the hydraulic gradient. There was essentially no nitrogen movement into the Yorktown aquiclude even though solutions of 2,000 ppm (soil basis) had been in the overlying sediments for 2 to 3 years. The possibility of the nitrogen moving into the deeper aqu
used for community water supplies is very s
Only the shallow groundwater above the Y
town Formation in the immediate area will be
taminated with nitrogen because there is
lateral dispersion away from the flow of gr
water toward the Chowan River. (Sande
ISWS)
W76-04099

QUALITY OF WATER DISCHARGED F
AN URBAN MOTORWAY,
Severn-Trent Water Authority, Birmi
(England). Dept. of Operations.
G. Hedley, and J. C. Lockley.
Water Pollution Control, Vol 74, No 6, p 65
1975. 13 fig, 4 tab, 8 ref.

Descriptors: *Water pollution so
*Highways, *Surface runoff, *Highway
*Corrosion, *Suspended load, *Dissolved
Water pollution, Storm runoff, Runoff, S
drainage, Snow management, Snow re
Snowmelt, Deicers, Snow, Ice, Sleet,
Saline water, Pollutant identification, Path
lutants.
Identifiers: Salting operations, Runoff
Aston Expressway(England), Highway de
tion, Motor vehicle emissions.

A twelve-month investigation into the qu
surface runoff from a section of the sev
Asteon Expressway was conducted in an
to determine sources of excess pollution l
and to relate the findings to road mana
techniques, notably salting for hazard re
Runoff samples were analyzed for chloric
and volatile suspended solids, iron, coppe
lead, nickel, cadmium, and chromium. Bo
centrations and total loadings of all par
showed definite peaks during winter
Chlorion, nickel, and chromium loading
further shown to be directly dependent
quantity of salt spread on the road. Othe
and solids loadings were traced to sources
motor vehicle corrosion and emissions,
down of road surface, and atmospheric f
was pointed out that the use of salt on ro
tributes greatly to corrosion of vehicles
influence deterioration of the road surface
(Bender-ISWS)
W76-04104

COLORADO RIVER BACTERIOL
SURVEY: PARKER STRIP AND
HAVASU, MAY 25-29, 1973,
Environmental Protection Agency, San F
Calif. Region IX; and Environmental P
Agency, San Franscisco, Calif. Surveill
Analysis Div.
K. G. Shimmin, and W. H. Shafer, Jr.
Report No EPA-909/9-73-002, 1973. 38 p,
tab, 2 append.

Descriptors: *Coliforms, *Colorado
*Public health, *Water pollution
*Environmental sanitation, *Arizona, *C
Salmonella, Pathogenic bacteria, Sept
Cesspools, Domestic wastes, Sewage
Surface drainage, Sewage effluents, T
Sewage treatment, Drainage, Recreation
On-site investigations, Water pollution.
Identifiers: *Bacteriological survey,
hazard, Parker Strip(Ariz), Lake Hav
Crazy Horse State Park(Ariz), Fecal
Leach fields, Chemical toilets.

A bacteriological survey of the Parker St
Havasu areas of the Colorado River
ducted jointly by the State of Arizona a
vironmental Protection Agency, Region
the Memorial Day weekend, May 25
Results of the study showed that feca
countes exceeded the levels recommend
mary contact recreation water at B
Marina and Buckskin Mountain State

-causing bacteria (Arizona group, Salmonel-
were recovered from the River in the vicinity
e pipe carrying effluent from the Buckskin
ment plant. A photograph showed people
ming and playing next to this effluent pipe.
ographic evidence documented ponding of
over the septic tank leach fields during a
use period at Crazy Horse State Park. The
c has easy access to this area. A description
analytical procedures used in the study was
ded. (Henley-ISWS)
04108

ELLING WATER QUALITY,
nonwealth Scientific and Industrial Research
ization, Griffith (Australia). Div. of Irriga-
esearch.
O'Loughlin.
ediction in Catchment Hydrology. Australian
my of Science, Canberra, Australia, 1975. p
5, 3 fig, 1 tab, 40 ref.

iptors: *Reviews, *Model studies, *Water
, *Dissolved oxygen, *Eutrophication,
rption, Ecosystems, Plankton, Phosphorus
unds, Sediments, Biochemical oxygen de-
Nutrients, Water pollution effects.

sometimes considered that water quality
ms ideally require that the complete aquatic
tem be modelled; however, judicious cho-
variables and processes can often be made
allow the system quality variables to be stu-
in separate compartments. Examples
sed are the dissolved oxygen - organic waste
and the nutrient - plankton model for
hication studies. Some remarks are also
n modelling applications involving adsorp-
sorption phenomena (such as phosphorus
ria between water and sediment). (See also
4128) (CSIRO)
4143

COMPONENTS OF AN ECOSYSTEM
L OF WESTERNPORT BAY,
rne Univ., Parkville (Australia). Centre for
mental Studies.
'Brien, and J. B. Hinwood.
dings of the Royal Society of Victoria,
87, Part 1, p 79-87, August 1975. 6 fig, 6

tors: *Bays, *Water circulation, *Path of
nts, *Australia, Tides, Computer models,
ems, Waste disposal, Water quality,
studies.
ers: *Westernport Bay(Vic).

r Quality Model of Westernport Bay in
Victoria, Australia, is being developed as
ep towards a total ecosystem model of the
he present structure of the model is
d, some preliminary results of its use are
d, and proposals for future extension and
on of the model are discussed. The inten-
he model is to predict pollutant levels in
waters resulting from a given waste
strategy in the area. Tests on the
namic and pollutant transport components
ealed good agreement between predicted
rved tidal heights and velocities, and yield
eviously unsuspected transport patterns
equire further field measurements for
on. (CSIRO)
48

AM FRONT, TWO - DIMENSIONAL
TION OF A MOVING INTRUSION
IN A THIN HORIZONTAL CONFINED
R,
ent of the Environment, Ottawa
Water Resources Branch; and Depar-
the Environment, Ottawa (Ontario). In-
ers Directorate.
ry bibliographic entry see Field 7C.
2

MONITORING OF EFFLUENT STREAMS.
For primary bibliographic entry see Field 5A.
W76-04187

AN EVALUATION OF SQUOXIN ON INSECT DRIFT,
Idaho Univ., Moscow. Dept. of Entomology.
For primary bibliographic entry see Field 5A.
W76-04206

GAS-EXCHANGE RATES IN A MALL LAKE AS DETERMINED BY THE RADON METHOD,
S. Emerson, W. Broecker, and D. W. Schindler.
J Fih Res Board Can, 30(10): 1475-1484, 1973.

Descriptors: *Pollutant identification, Lakes, Canada, Algae, Boundary layers, *Carbon dioxide, Gases, Radium radioisotopes, Fertilization, Nitrogen, Phosphorus.
Identifiers: *Radon method, *Gas-exchange rate(Lakes).

The Rn method, used previously in ocean-atmosphere systems, is used to determine the gas-exchange ate between the atmosphere and lake 27 of the Experimental Lakes Area (Canada). Fertilization of the lake with N and P caused the carbon dioxide partial pressure in the lake water to drop below atmospheric levels; hence, in order to better understand the carbon budget of the lake, an estimate of the CO2 gas-exchange rate was necessary. To determine gas-exchange rates by measuring Rn evasion to the atmosphere the source of Rn in the lake water must be dissolved Ra. Since the Rn concentration in lakes derives not only from the decay of dissolved Ra but also from the inflow of Rn-rich groundwaters, Ra was added to the lake to increase the Rn concentration well above this fluctuating background level. Although this procedure was complicated by algal uptake of the Ra in the lake, we were able to place limits on the gas-exchange rate. The 'stagnant boundary layer' thickness is approximately 300 microns. This value is among te largest observed in natural waters. Using this value and the partial pressure of CO2 in th lake watr, an invasion rate of 17 plus or minus 8 mmoles CO2/m2 day was calculated.--Copyright 1974, Biological Abstracts, Inc.
W76-04219

IRRIGATION RETURN FLOW, A BIBLIOGRAPHY.
Office of Water Research and Technology, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 585, $7.75 in paper copy, $2.25 in microfiche. Water Resources Scientific Information Center Report OWRT/WRSIC 75-209, December 1975, 207 p.

Descriptors: *Return flow, *Irrigation practices, *Salinity, *Bibliographies, Path of pollutants, Nitrates, Water quality, Water pollution, Irrigation efficiency, *Irrigation effects.

This report, containing 132 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 89,737 abstracts covering SWRA through October 15, 1975 (Volume 8, Number 20). Author and subject indexes are included. (OWRT)
W76-04230

A STUDY OF OXYGEN-NITROGEN BALANCE IN WATERBLOOM OUTBREAKS,
East Tennessee State Univ., Johnson City. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-04234

PLANKTON MICRO-FOSSILS AS INDICATORS OF PALEOTROPHIC DYNAMISM IN FLATHEAD LAKE,
Montana Univ., Missoula.
For primary bibliographic entry see Field 5C.
W76-04235

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME II,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W76-04244

THE BOD'S AND TOXICITY OF EFFLUENTS FROM SULPHITE PULPING FOR NEWSPRINT,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
For primary bibliographic entry see Field 5C.
W76-04245

STUDY OF THE WASTE CHARACTERISTICS OF FISH PROCESSING PLANTS, LOCATED IN THE MARITIME REGION,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
K. T. Brodersen.
Economic and Technical Review Report EPS 3-WP-73-7, Environmental Protection Service, Environment Canada, Ottawa, Canada, December, 1973, 77 p, 6 fig, 33 tab, 3 ref.

Descriptors: *Wastes, *Fish, Herrings, Shellfish, Water types, Biological membranes, Suspended solids, Water utilization, Biochemical Oxygen Demand, *Industrial wastes, Water pollution sources, Waste water treatment.
Identifiers: *Fish processing plants, Groundfish, Maritimes, Fish meal.

Fish processing plants located in Shippegan, Caraquet, and Lameque region of the Province of New Brunswick, were chosen for a study to determine the waste characteristics of the fish processing industry. The effluent sampling and analyses program characterizes waste from 8 plants processing groundfish, shellfish, combined groundfish and shellfish, herring, and fish meal. Waste flows and plant production figures were incorporated with the waste paramater BOD5, suspended solids and oil content for each type of processing plant. (Environment Canada)
W76-04252

EFFECT OF EFFLUENT FROM BEEF FEEDLOTS ON THE PHYSICAL AND CHEMICAL PROPERTIES OF SOIL,
Nebraska Univ. Lincoln Dept. of Agronomy.
D. G. Hinrichs, A. P. Mazurak, and N. P. Swanson.
Soil Science Proceedings, Vol 38, No 4, p 661-663, July/August, 1974. 6 tab, 11 ref.

Descriptors: *Feed lots, *Agricultural runoff, Effluents, *Soil chemical properties, *Soil physical properties, Irrigation, Hydraulics, Wate pollution effects, Waste disposal, Precipitation(Atmospheric), *Path of pollutants.
Identifiers: Land application, Beef feedlot runoff.

The effects on soil physical properties of using beef feedlot effluent as irrigation water was studied. Effluent from beef feedlots was applied as irrigation to silty clay loam soil in eastern Nebraska over a two year period. Soil samples from 0 to 2 cm depth were collected at three locations before, during, and after each growing season. The effluent applications caused no significant differences in the soil bulk density, the geometric mean diameter of water-stable aggregates, the water-retention characteristics, or size distribution of the particles in the soil. However, the hydraulic conductivities of disturbed soil samples showed

significant differences. A decrease in hydraulic conductivity for the effluent-treated areas was noted, probably associated with the dispersion of the soil by the sodium, ammonia, and potassium in the effluent. A decrease in the permeability and an increase in the salt content of the soil caused by the application of the effluent were largely negated by precipitation during the off-irrigation season. It was concluded that the application of 2.5 and 5.0 cm of effluent each week during the growing season caused no deterioration of the physical conditon of the soil. (Orr-FIRL)
W76-04289

METAL CONTENTS OF LAKE SEDIMENT CORES FROM ESTABLISHED MINING AREAS: AN INTERFACE OF EXPLORATION AND ENVIRONMENTAL GEOCHEMISTRY,
Geological Survey of Canada Ottawa, (Ontario). Resource Geophysics and Geochemistry Div.
R. J. Allan.
Geological Survey of Canada, Paper 74-1, Part B, p 43-49, March, 1974.

Descriptors: Waste water treatment, *Industrial wastes, *Mining, *Metals, Sediments, Water pollution sources, Environmental effects, *Lake sediments, Lakes, Canada, Geochemistry, Pollutant identification.

Sample sediments from lakes in three mining areas of the southern Canadian shield showed the effects of pollution from the mining industry. Environmental contamination from mining operations may be caused by tailings introduced as solids into drainage systems, leachates from onshore tailing piles, effluents from mines or mining plants, or airborne particles from crushers and smelters. Sample cores were taken and analyzed These illustrated the variation between original pre-mining metal concentrations and present-day concentrations. The effects seem to be limited to the surface few centimeters, and are quite variable. (Kramer-FIRL)
W76-04291

TWO-DIMENSIONAL MASS DISPERSION IN RIVERS,
Colorado State Univ., Fort Collins.
F. M. Holly, Jr.
Hydrology Papers, No 78, September 1975. 67 p, 42 fig, 12 tab, 40 ref, 5 append.

Descriptors: *Dispersion, *Computer models, *Diffusivity, *Water pollution, *Laboratory tests, Rivers, Mathematical studies, Fluid mechanics, Boundary processes, Turbulence, Liquid wastes, Model studies, Mixing, *Path of pollutants.
Identifiers: *Finite difference method, *Missouri River(Iowa), *Clinch River(Va), Transverse diffusivity, Bed shear.

The objective of this research was to develop an efficient computational model for the prediction of time-dependent mass dispersion in natural streams by using the results of transverse diffusivity in laboratory channels. The computational model was a partial differential equation expressing conservation of pollutant mass in a control volume. The computational model developed was based on a finite-difference solution to the depth-averaged dispersion equation, for predicting concentrations resulting from a pollutant source of arbitrary time and space configuration in a stream of any geometry with non-uniform steady flow. Problems of numerical instability and damping in the convective stage of the computation were avoided through the use of a half-implicit and half-implicit second order differencing scheme for the space derivative. The result was a model which was unconditionally stable with accuracy not dependent on the time and distance steps. The triangular-channel tests performed indicated that the transverse diffusivity is constant within a cross section. This suggested an interaction between bed shear and transverse shear. The applicability of the model was demonstrated through simulation of dispersion experiments for the Missouri River and Clinch River. (Singh-ISWS)
W76-04309

DISPERSION OF MASS IN OPEN-CHANNEL FLOW,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2J.
W76-04311

GUIDELINES ON SAMPLING AND STATISTICAL METHODOLOGIES FOR AMBIENT PESTICIDE MONITORING.
Federal Working Group on Pest Management, Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-04315

ESTUARY STUDIES,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Programs.
H. W. Jackson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 482, $5.75 in paper copy, $2.25 in microfiche. Manual 161.3, September 1972. 151 p, 36 fig, 13 tab, 180 ref.

Descriptors: *Estuaries, *Estuarine environment, *Environment, *Education, *Training, Chemistry, Geology, Pollutants, *Water pollution, Biology, Estuarine fisheries, Bioindicators, Pollutant identification, Aquatic environment, Aquatic life, Bioassay, Benthos.

This manual consists of a collection of expanded basic outlines that deal with the estuarine environment. The reference outlines were selected and developed to provide the student enrolled in scheduled training courses of the Office of Water Programs, Environmental Protection Agency, with a fund of the best available current information pertinent to the subject matter of the course. Individual instructors may provide additional material to cover special aspects of their own presentations. This manual will be useful to anyone who has need for information on the subjects covered. However, it should be understood that the manual will have its greatest value as an adjunct to classroom presentations. (Sims-ISWS)
W76-04319

A DISPERSION CURVE STUDY OF MODEL DREDGE SPOIL BASINS,
Texas A and M Univ., College Station. Dept. of Civil Engineering; and Texas A and M Univ., College Station. Coastal and Ocean Engineering Div.
R. Male, and D. R. Basco.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-75-10329, $6.75 in paper copy, $2.25 in microfiche. Texas A and M University Civil Engineering Department Sea Grant College Publication, TAMU-SG-75-201, and C.D.S. Report No 180, September 1974. 139 p, 58 fig, 14 tab, 20 ref, 6 append. NOAA 04-3-158-18.

Descriptors: *Dredging, *Spoil banks, Basins, *Dispersion, Water quality standards, *Settling basins, Effluents, Tracers, Baffles, Dyes, Dikes, Computer programs, Sediment transport, Model studies, Sediments, Waste disposal, Variability, Intakes.
Identifiers: *Spoil basins, Dispersion curve, Tracer testing, Baffle box, Settling tanks, Spoil basin inlets, Log normal function.

Settling tank theory and tracer testing techniques were used to compare a plain pipe inlet, various baffled inlet designs, and a reaction-jet inlet in a model spoil basin. Methods were developed to use the dye tracing technique with the tank effluent being recycled. Baffling improved the tank performance over the uncontrolled condition. A gle baffle centrally placed in front of the i proved to be better than: (1) the same baffle collinear baffles on each side, (2) a baffle box, (3) a reaction-jet plate on the inlet pipe. Increa the water depth also yielded significant impr ments in behavior. The results of this study dicated that basin performance can be appreci improved by constructing a short dike acros path of the influent and by keeping the water d at a maximum. Field testing was recommend determine dispersion curves under various c tions in the basin. A method was shown to c late sediment removal from the interactio dispersion curves with a quiescent column se area. (Roberts-ISWS)
W76-04321

THE NEEDS FOR WATER QUALITY MO ON AGRICULTURAL WATERSHEDS.
Southeast Environmental Research Lab., A Ga.
H. P. Nicholson.
Journal of Environmental Quality, Vol. 4, N 21-23, (Jan.-March 1975). 3 p, 6 ref.

Descriptors: *Path of pollu *Watersheds(Basins), *Federal Water Po Control Act, *Agricultural runoff, *Agric chemicals, *Mathematical models, processing, Water pollution sources, Sedi tion, Soil erosion, Surface runoff, Fert Animal wastes, Treatment, Grants, Gover finance, Mathematical studies.
Identifiers: Federal Water Pollution Act(FWPCA) Amendments of 1972, *No sources(Pollution).

Agricultural practices are now accounting proximately one-half of the sediment poll the United States. The Federal Water P Control Act Amendments of 1972, recogni effect such pollution was having on overal quality, encouraged states to establish ment programs to control nonpoint sources lution. Under the 1972 Amendments, st grams may receive federal funding and eligible for grants to develop new methods trolling agricultural pollution. Most agri pollution cannot be controlled by standard tion and treatment systems; however, funding could stimulate the developm mathematical formulas which would allow of computer technology in gathering and a data concerning agricultural pollution A cessful management program developed to provide techniques for controlling soil as well as for controlling the runoff of wastes into the country's waterways. The will also have to provide methods for plant residues and animal wastes on the order to accomplish these diverse goals, ment prgrams should be planned fo drainage basins. (Hoffman-Florida)
W76-04353

PRELIMINARY INVESTIGATION GROUND-WATER QUALITY AND ITS ON SUBURBAN DEVELOPMENT IN V VALLEY, NEVADA,
Nevada Univ., Reno. Desert Research In
For primary bibliographic entry see Field
W76-04386

BIOTIC CHANGES IN THE WI TIC/SHETUCKET RIVER ASSOCIATE IMPROVEMENTS IN SEWAGE TREAT
Connecticut Univ., Storrs. Inst Resources.
For primary bibliographic entry see Field
W76-04388

CTS OF A LANDFILL OPERATION ON UND-WATER QUALITY IN NORTH WARD COUNTY, FLORIDA,
gical Survey, Tallahassee, Fla.
J. Pitt, Jr.
-file report 75-405, 1975. 48 p, 5 fig, 2 tab, 9

iptors: *Florida, *Water pollution sources, ndwater, *Landfills, *Waste dumps, *Path llutants, Water analysis, Water quality, ical analysis, Leachate, Organic wastes, e, Inorganic compounds, Data collections. fiers: Broward County(Fla).

uality of the shallow groundwater underlying fill in north Broward County, Florida is af- by leachates from landfill materials. Water es from shallow wells in the landfill and radient from it show that there are definite es in the water quality in the shallow part (0- or 0-6 metres) of the aquifer as reflected by es in concentration of most of the water- parameters studied, but at the 90-foot (27- depth the changes are not so pronounced. udge disposal operation appears to be the cause of concern. The concentration of f the constituents associated with organic e from the sludge decreased very little and e cases not at all as the groundwater moved (18 metres) downgradient of the landfill, ther constituents and characteristics such idity, sulfate, flouride, arsenic, detergents, grease, and phosphate generally decreased entration in that same distance. (Woodard-

1404

EYSVILLE QUADRANGLE: GEOLOGY, OLOGY AND MINERAL RESOURCES,
ical Survey, Parkville, Md.
mary bibliographic entry see Field 7C.
407

D STATES GEOLOGICAL SURVEY'S OGEOLOGICAL RESEARCH PRO- S AND PLANS RELATED TO DISPOSAL DIOACTIVE WASTE INTO GEOLOGIC ATIONS,
cal Survey, Reston, Va.
eBuchananne, and W. S. Twenhofel.
le report 75-626, November 1975. 23 p, 53

tors: *Radioactive waste disposal, ground, *Solid wastes, *Path of pollutants, dwater movement, Aquifers, Reviews, , Model studies, Hydrogeology, Planning, ion, Geologic formations.
rs: *Radioactive waste migration.

. Geological Survey has cooperated with ed States Energy Research and Develop- dministration, formerly the Atomic Energy sion, for more than 30 years on research o the disposal of radioactive waste into al formations. As a part of its own program, the U.S. Geological Survey has geochemical and digital model studies of nsport at four of its research centers. At time field studies on the hydrogeology of e owned low-level radioactive solid waste ounds are being made to provide the field ions of waste migration needed to test the al and laboratory approaches. ological criteria will be developed for use selection of future radioactive waste sites. These programs are described. d-USGS)
11

OCK FEEDLOTS ARE POLLUTION
,
.
Bulletin of the University of Minnesota, p h-April, 1971. 2 fig.

Descriptors: *Farm wastes, *Livestock, Waste disposal, *Feed lots, *Water pollution sources, *Minnesota, Biochemical oxygen demand, Nitrates, Sewage, Coliforms, Regulation, Water pollution control.

The discharge of animal and human waste into Minnesota lakes and rivers is a serious pollution hazard. Many farmers have dug a direct connection to rivers, streams, and lakes, piled excess manure on the edge of lakes, allowed their animals to defecate on frozen lakes, and left dead animals on riverbanks and in lakes. Lake Yankton is used as a cesspool for the community of Balaton. County ditches, which collect wastes and run into rivers, are ubiquitous. County Ditch 29 had a massive B Coli count, and a toxic nitrate level of 17 at its start. The Minnesota Pollution Control Agency (PCA) is taking no action on this, and has forgotten the January, 1971, deadline imposed on the community of Ruthton to submit detailed plans for a sewage treatment system. The Redwood River (before the community of Marshall with a population of 10,000 empties its uncreated sewage into it) has a B Coli count of 110,000 per 100 ml, while the accepted norm is 1,000 per ml. The BOD is over 30. Enforcement of regulations must be stricter, farmers must improve their feedlots, and sewage treatment facilities must be built. (East Central University)
W76-04413

A PERSPECTIVE FOR CONNECTICUT,
Connecticut Univ., Storrs.
J. J. Kolega.
Presented at Conference on Agricultural and Processing Wastes in the Eastern Region: A Perspective, Philadelphia, Pennsylvania, December 1-3, 1970, p 44-48.

Descriptors: *Farm wastes, *Connecticut, *Poultry, *Dairy industry, Agricultural runoff, Odor, Water pollution, Septic tanks, Research and development, Waste disposal.
Identifiers: *Waste management, Horses.

Agricultural waste problems in Connecticut are primarily those associated with the poultry and dairy industry. Prime problems for the dairy industry are surface runoff from paved areas; surface discharges into streams or into a drinking water supply watershed, and milking center discharges. The poultry producer's problems are even more serious due to the small amount of land accomodating his operations and due to the corresponding population growth around these operations. The major complaints against the poultry producer have been directed toward the odors emanating from his facilities. Another problem requiring attention in Connecticut is the handling of septic tank pumpings. About two-thirds of Connecticut's geographic area is estimated to be using septic-tank disposal systems or their equivalent. University of Connecticut studies related to these three problem areas are listed. A relatively new problem area developing in Connecticut is related to the influx of pleasure horses. A general recommendation handling of the wastes from these animals has not yet been developed. (Merryman-East Central)
W76-04417

FEEDLOT WASTE DISPOSAL AND WATER POLLUTION,
Colorado State Univ., Fort Collins. Agricultural Extension Service.
R. Hansen.
AE70-71RWHI, Colorado State University, 5 p, 1 tab.

Descriptors: *Farm wastes, *Waste disposal, *Feed lots, *Agricultural runoff, *Water pollution, Lagoons, *Settling basins, Waste treatment, *Aerated lagoons.
Identifiers: Land disposal, Detention ponds, Settling channels.

The principal sources of pollution from feedlot wastes are organic substances, volatile substances, inorganic substances, pathogens, and insects harbored by the waste material. While the constituents of manure are especially a problem if allowed to reach bodies of water, the nutrient content of manure makes it a valuable fertilizer material. One of the major pollution problems of feedlot wastes is agricultural runoff. Studies have indicated that the runoff water can be collected and disposed of by several methods. Options include retention ponds, lagoons, settling basins, settling channels, and land disposal. Biological treatment systems can be used, but it is difficult to operate them satisfactorily with the intermittent flows usually encountered in runoff collection systems. Although the likelihood of groundwater pollution from feedlots seems small, very little information is available on this subject. (Penrod-East Central)
W76-04419

AGRICULTURE AND NATURE'S NUTRIENT CYCLES,
Fertilizer Inst., Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-04422

CATTLE FEEDLOT WASTEWATER SALINITY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-04429

FECAL COLIFORM POLLUTION IN AN AGRICULTURAL ENVIRONMENT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
J. K. Jones.
M. S. Thesis, 1971, 122 p, 7 fig, 10 tab, 84 ref.

Descriptors: *Farm wastes, *Water pollution, *Agricultural runoff, *Feed lots, Livestock, *Coliforms, Ammonia, Nitrogen, Biochemical oxygen demand, Bivindicator, Pollutant identification, Path of pollutants.
Identifiers: Membrane filter method.

A study was undertaken with the primary objective of characterizing the types and numbers of coliform organisms occurring in fresh and stored livestock fecal wastes and in waters polluted by these wastes. A membrane filter procedure was used to detect the total coliform and fecal coliform groups and these groups were used to examine the significance of the organisms as indicators of livestock waste pollution. Fresh bovine, ovine and equine fecal samples showed an overall range of total coliform counts of 7400 to 65 million per gram dry weight and of fecal coliform counts, 5800 to 60 million per gram. In an environment of stored bovine manure, a reduction in numbers of coliforms occurs. Complex interactions of the coliform population with the natural environment determine the types and numbers of indicator organisms that reach water supplies in runoff from a livestock rearing area. The ammonia nitrogen concentration and biochemical oxygen demand may be at very low levels even when coliform counts indicate that water pollution by runoff is occurring. The detection of fecal coliforms by the membrane filter FC test in waters polluted mainly by fecal wastes can be good; 95.2 percent of 733 FC positive colonies from water samples were confirmed as Escherichia IMViC types I or II. (Cartmell-East Central)
W76-04432

5C. Effects Of Pollution

UPTAKE AND DISTRIBUTION OF TRACE METALS IN FISH,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.

G. J. Atchison.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 496, $4.00 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 73, December 1975. 21 p, 3 fig, 11 tab, 24 ref. OWRT A-038-IND(1).

Descriptors: *Cadmium, *Chromium, *Fish physiology, Heavy metals, *Shiners, *Bass, Water pollution sources, *Sunfishes, *Absorption, Trace elements, Indiana, Lakes, Eutrophication, Industrial wastes, Spectrophotometry, *Metals, Pollutant identification.
Identifiers: Palestine Lake(Ind), Metal plating wastes.

Palestine Lake, near Warsaw, Indiana, is eutrophic and has for many years received wastes containing cadmium and chromium from a nearby metal plating shop. No effects of the effluent on fish distribution were found using electrofishing catch per unit effort analysis. Bluegill (Lepomis macrochirus) and largemouth bass (Micropterus salmoides) were analyzed for cadmium and chromium using a nitric acid-perchloric acid wet digestion followed by atomic absorption spectrophotometry for quantitation. Muscle, gill, liver, and gastrointestinal tract were analyzed. Whole body samples of golden shiners (Noremigonus crysoleucas) were also analyzed. Due to the small dry weights of the samples being studied and the relative insensitivity of the methods, no difference was noted among the three different species, the four samples sites in the lake, or the several age classes of largemouth bass represented in the samples. Concentrations reported here are, however, above most of those reported in the literature.
W76-04010

STUDIES ON THE EFFECTS OF THERMAL ADDITIONS ON SELECTED ZOOPLANKTON POPULATIONS,
Minnesota Univ., Duluth. School of Medicine.
W. R. Swain, R. M. Wilson, and R. P. Neri.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 497, $5.00 in paper copy, $2.25 in microfiche. Water Resources Research Center, St. Paul, Bulletin No 84, Nov 1975. 85 p, 45 fig, 8 tab, 45 ref. OWRT B-097-MINN(2).

Descriptors: *Thermal pollution, *Zooplankton, *Lake Superior, Benthos, Algae, Minnesota, Water pollution effects, *Remote sensing, Bioindicators, Measurement.

The objective was to examine the effects of calefaction upon members of the animal portion of the Lake Superior ecosystem. Additionally, certain species which are widely available were also utilized in order to establish a point of reference which could be used by workers in other parts of the country. The conventional approach to a problem of this sort has been to measure the effects of an effluent source on a specific community and attempt to understand the ecological interrelationships of the altered environment. The method described here utilized the establishment of an artificial segment of Lake Superior in a carefully controlled laboratory setting which could be modified at will in order to observe the impacts of each change upon the test organism or community. Critical to this study was a method of observation of organism behavior which allowed remote monitoring of the population, but did not alter the environment of the test animals. Such a method was developed and is described. This method enabled measurement of critical physiological and behavioral responses which provided a baseline for work with thermal additions. (Waelti-Minnesota)
W76-04012

THE EFFECT OF THE GOSHEN BAY DIKE ON THE BENTHOS OF UTAH LAKE IN RELATION TO WATER QUALITY,
Brigham Young Univ., Provo, Utah. Dept. of Zoology.
J. R. Barnes, T. W. Toole, D. L. Tillman, and D. K. Shiozawa.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 553, $5.00 in paper copy, $2.25 in microfiche. Final Report, (1974). 93 p, 31 fig, 25 tab, 33 ref. OWRT A-012-UTAH(1). 14-31-0001-3845.

Descriptors: Aquatic animals, *Benthos, *Utah, Dikes, *Benthic fauna, *Benthic flora, Aquatic populations, Aquatic habitats, Reservoirs, Aquatic productivity, Lakes, Saline lakes, Lake morphology, Diptera, *Littoral, Invertebrates, *Standing crops, *Pre-impoundment.
Identifiers: Goshen Bay(Utah), Utah Lake(Utah), Macroinvertebrates.

As part of the Bonneville Unit of the Central Utah Project the southern one third of Utah Lake will be diked off. This area consists of two major macroinvertebrate habitats, a rocky shore litoral zone along the eastern shore and the silty clay region which makes up most of the area. Cement artificial substrate samplers were used to sample the littoral zone and an Ekman dredge and KB corer were used in the silty clay region. In the littoral zone an amphipod and a chironomid were the dominant organisms in numbers and biomass. Only two taxa, chironomids and oligochaetes, were collected from the silty clay area. The standing crop estimates for both areas shows that both are highly productive and, in part, play an important role in supporting the fishery of Utah Lake. The littoral zone, based only on biomass values for the two dominant species, ranks among the top ten richest lakes in the United States in macroinvertebrate standing crop values. The littoral zone undoubtedly plays an important role in determining the water quality and rate of eutrophication in part of the lake. When the dike is constructed the littoral area that will be eliminated should be duplicated on the inside of the dike.
W76-04013

OXIDATION OF LAKE AND IMPOUNDMENT HYPOLIMNIA,
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple, Jr., J. V. Hunter, F. B. Trama, and T. J. Tuffey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 500, $5.00 in paper copy, $2.25 in microfiche. Completion Report, October 1975. 87 p, 31 fig, 14 tab, 5 ref, 2 append. OWRT B-050-NJ(2), B-058-NJ(1). 14-31-0001-5091, 14-31-0001-3913.

Descriptors: *Hypolimnion, *Oxygenation, *Water quality, Water chemistry, *Phosphates, *Lakes, Biochemical oxygen demand, Nutrients, Phytoplankton, Benthic fauna, *Eutrophication, *New Jersey, Reservoirs, *Oxidation, Dissolved oxygen.
Identifiers: Spruce Run Reservoir(NJ), Oxygenators.

Research to determine the effect of oxygenation on the hypolimnia of eutrophic lakes was carried out at Spruce Run Reservoir in New Jersey. A new type of oxygenator was utilized which dissolves oxygen into the lower depths of the lake, in water masses directed horizontally in slow but turbulent currents, which do not disturb stratification. The apparatus uses liquid oxygen, and fine pore diffusers. The efficiency of the operation was less than anticipated; but sufficient oxygen was introduced to maintain trout and alewives during the summer season. It was hoped that the maintenance of aerobic conditions would interrupt the eutrophication process in the lake by retarding the solution of phosphorus in the bottom sediments. However, in this lake it appears that the phosphorus content is determined primarily by physical condition storm runoff from tributaries; and therefore not be affected by the oxygenation pro Biological surveys were made; no significan ferences were found between the test arm a control arm of the lake, either as r phytoplankton or bottom fauna.
W76-04016

HYDROLOGIC DATA SUMMARY: CL WATER RIVER BASIN, WATER YEAR 1974,
Washington Univ., Seattle. Coll. of Resources.
For primary bibliographic entry see Field 4C
W76-04019

AQUATIC SURVEY OF SELECTED STR WITH CRITICAL HABITATS ON NATI RESOURCES LANDS AFFECTED LIVESTOCK AND RECREATION,
Brigham Young Univ., Provo, Utah. Cen Health and Environmental Studies.
For primary bibliographic entry see Field 4C
W76-04042

CADMIUM-INDUCED HISTOPATHOLO CHANGES IN GOLDFISH,
R. Tafanelli, and R. C. Summerfelt.
In: The Pathology of Fishes, Ribelin, W E Migaki, eds. The University of Wisconsin Madison, Wisconsin, 1975. Chap 25, p 61 fig, 5 tab, 56 ref.

Descriptors: Water pollution sources, health, *Toxicity, Gonads, *Fish d *Bioassay, *Cadmium, *Lethal limit, An techniques, *Microscopy, *Path of pol *Metals, *Reproduction, *Water pollution Food webs, Laboratory tests, Toxicants, I al wastes.
Identifiers: Tissue analysis, LD50, Subl fects, *Histopathology, Bioaccum *Golfish, Kidney damage.

Cadmium is present in the environment a taminant as a result of production or utili this heavy metal in manufacturing proces LD50 of intraperitoneal injections of CdC goldfish was 30.0, 23.0, and 20.0 mg/kg we at 24, 48 and 96 hours, respectively. In the concentration of cadmium salts lethal generally less than this, with toxicity expl precipitation of mucoproteins on the gill um and resulting in suffocation. Examin gonadal tissue of goldfish receiving multip tions of cadmium indicated histopath changes including damage to germ c seminiferous tubules. Increased pat changes in kidneys were observed in cad jected fish. The liver had greater toleranc mium than other organs did. Cadmium n serious effects on osmoregulation, hema and gametogenesis. Continuous expo sublethal doses resulted in large accumul residues in several organs and biological cation through the food chain could faci transfer of cadmium to man. (Katz)
W76-04043

LESIONS DUE TO DRUGS,
H-H. Reichenbach-Klinke.
In: The Pathology of Fishes, Ribelin, W Migaki, eds. University of Wisconsi Madison, Wisc. Chap 26, p 647-656, 1975 ref.

Descriptors: Pesticides, *Pesticide *Mercury, *Antibiotics(Pesticides), sulfate, Microscopy, *Public health, Aq *Fish diseases, *Cytological studies, Inl Vitamins, Analytical techniques, Management, Fish farming, Copper co Algicides, Enzymes.

fiers: *Drugs, Methylene blue, Malachite Masoten, *Chemotherapy, Sulfonamides, ndazole.

nber of common drugs were tested over a eriod of time in order to evaluate cellular al-ns resulting from the application of these Most drugs used in fish cultivation can lead dues (copper, chlorinated hydrocarbons), al-ns in the kidney and liver and inhibition of nal enzymes. The residues can be trans-to man. It is recommended that use of these including malachite green, copper sulfate, rials, thiabendazole, Masoten, and sulfona-be considered only in urgent cases. Medica-such as methylene blue and vitamins are ted for use in place of drugs with cell-ing effects. (Katz)
4044

ICALLY INDUCED LESIONS IN RINE OR MARINE TELEOSTS,
ardner.
e Pathology of Fishes, Ribelin, W E and G , eds. University of Wisconsin Press, Chap 7-693, 1975. 30 fig, 21 ref.

tors: Animal pathology, *Oil, *Fishkill, ts, Marine fish, Environmental effects, scopy, *Metals, Water pollution effects, iseases, Analytical techniques, Laboratory esticides, Copper, Silver, Zinc, Mercury, m, Effluents, Estuarine environment, y.
ers: *Histology, *Menhaden, nichog, Fundulus heteroclitus, Menidia , Crude, Gills, Methoxychlor.

ally induced and spontaneous lesions in marine teleosts, including experimentation e common mummichog (Fundulus litus) are discussed. Toxicity tests were ted with cadmium, copper, mercury, silver, d methoxychlor, as well as crude oil. caused a heavy gill-mucus response in Fun-Mercury, silver and copper produced le-the olfactory and lateral line systems. il produced lesions in the olfactory organs dia menidia. Many of the chemical wastes ged into the aquatic environment may be similar neurotoxic effects within the sen-ans of the teleost. Disablement of sensory on in some organisms can make them ore susceptible to enemies, predation, dis-d other hazards in their environment. g' menhaden were captured and examined ns and anatomical change. (Katz)
045

TAL ANOMALIES IN MARINE STS,
alentine.
Pathology of Fishes, Ribelin, W E and G, eds. University of Wisconsin Press, , Wisconsin, Chap 28, p 695-718, 1975. 8 , 43 ref.

ors: Deformation, *Pathology, *Bass, letabolism, *Calcium, *California, *Fish , *Teleosts, Animal pathology, Aquatic icants, Water polution effects, Environ-ffects, Heavy metals, DDT, Pesticides.
rs: Barred sand bass, Paralabrax nebu-eletal anomalies, Gill rakers.

and bass (Paralabrax nebulifer) collected ern California were examined internally rnally for skeletal anomalies. Observed s involved gill rakers, bones of the oper-ies, snubnosedness, cranial assymetries, alies and deformed vertebral columns. as a significant difference between y of anomalies observed in Southern a and Baja California (control population) nd bass. There existed an excellent as-between gill raker anomalies and both in-ternal and external anomalies. The anomalies are apparently not congenital and increase in both frequency and severity with increasing age of the fish. The causative mechanisms producing these skeletal anomalies are unknown but may be due to metabolic interference by accumulated toxicants. (Katz)
W76-04046

BACTERIAL DEGRADATION AND EMULSIFICATION OF NO. 6 FUEL OIL,
University of Western Ontario, London. Faculty of Engineering Science.
For primary bibliographic entry see Field 5D.
W76-04060

VERTICAL EDDY DIFFUSION STUDIES IN THE THERMOCLINE OF A SMALL STRATIFIED LAKE,
For primary bibliographic entry see Field 5B.
W76-04082

AN AERIAL-PHOTOGRPHIC ANALYSIS OF THE ENVIRON'MENTAL IMPACT OF CLAY MINING IN NEW JERSEY,
Earth Satellite Corp., Washington, D.C. Geosciences and Environmental Applications Div.
For primary bibliographic entry see Field 5A.
W76-04092

ENVIRONMENTAL CONCERNS AND DECISIONS FOR THE MINING INUDSTRY,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5G.
W76-04093

COLORADO RIVER BACTERIOLOGICAL SURVEY: PARKER STRIP AND LAKE HAVASU, MAY 25-29, 1973,
Environmental Protection Agency, San Francisco, Calif. Region IX; and Environmental Protection Agency, San Franscisco, Calif. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W76-04108

MODELLING WATER QUALITY,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W76-04143

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRIAN SHIELD LAKES OF NORTHWESTERN ONTARIO,
For primary bibliographic entry see Field 5A.
W76-04193

AN IN-SITU STUDY OF THE SUTRITION OF LAKE ZOOPLANKTON USING CARBON 14 AND PHOSPHOROUS 32, FLATHEAD LAKE, MONTANA,
Montana Univ., Missoula.
G. Voerman, A. Gaufin, and J. Tibbs.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 668, $4.00 in paper copy, $2.25 in microfiche. Research Report No 72, Montana University Joint Water Resources Research Center, Bozeman, December 1975. 36 p, 5 fig, 12 tab, 36 ref. OWRT A-085-MONT (1).

Descriptors: *Zooplankton, *Microorganisms, Ecosystems, Oligotrophy, *Water quality, *Montana, Nutrient requirements, Lakes, *Tracers, Phytoplankton, *Food chains, Trophic level, Aquatic populations, Bioindicators.
Identifiers: *Flathead Lake(Mont), *Lake ecosystems, *Oligotrophic lakes.

This study was undertaken to determine the state of zooplankton nutrition in Flathead Lake, Montana, using C-14 as a radiotracer. Flathead Lake continues to be one of the most oligotrophic lakes in North America. This statement is supported by both chemical and biological data from the present study. Orthophosphate levels remain well below 10 microgram/liter, phytoplankton biomass is lower in 1975 than it has been in recent history and phytoplankton and zooplankton species are still indicative of very oligotrophic conditions. Further evidence for this is provided through zooplankton grazing data which indicates that Flathead Lake is very lightly buffered by organic detritus, a situation typical of most oligotrophic lakes. Of particular interest is the accurate measurement of phosphates in Flathead Lake for the first time, making it possible to monitor previously undetectible phosphorus dynamics so the present excellent water quality of the lake can be maintained.
W76-04231

A STUDY OF OXYGEN-NITROGEN BALANCE IN WATERBLOOM OUTBREAKS,
East Tennessee State Univ., Johnson City. Dept. of Biology.
J. T. Wyatt.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 618, $3.50 in paper copy, $2.25 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report No 46, November, 1975, 9 p, 21 ref. OWRT A-0290TENN(2). 14-31-0001-4043.

Descriptors: *Nitrogen fixation, Algae, Reaeration, *Cyanophyta, *Eutrophication, Water pollution effects, Plankton, Aquatic microorganisms, Oxygenation.
Identifiers: Nitrogenase activity, *Oxygen-nitrogen balance, Anoxic conditions, Euplankton.

The research involved laboratory and field investigations of the influence of 02:N2 relationships on nitrogenase activity (nitrogen fixation) of euplanktonic blue-green algae. Special attention was given to the linkage between 'waterbloom' potential and high nitrogenase activity as influenced by favorable 02:N2 tensions. About half of the nitrogen-fixing blue-green algal strains isolated from 'waterbloom' outbreaks exhibit nitrogenase enhancement when 02 is less than 1 mg/l and N2 is as high as 1 mg/l. Prolonged exposure (48-72 hrs.) to anoxic conditions causes precetible aberrations in experimental cells. Substantial levels of combined nitrogen in the growth medium enhance rather than depress nitrogen-fixation. Under simulated hypolimnion conditions, experiments with partial hydrogen atmospheres suggest that hydrogenase may be a prime source of electrons (Via ferredoxin) for N2 reduction. Most evidence to date still supports the proposition that 'waterblooms' do originate in the lower levels of impoundments. (Larson-Tennessee)
W76-04234

PLANKTON MICRO-FOSSILS AS INDICATORS OF PALEOTROPHIC DYNAMISM IN FLATHEAD LAKE,
Montana Univ., Missoula.
D. S. Potter, and J. F. Tibbs.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 617, $4.00 in paper copy, $2.25 in microfiche. Research Report No 54, Montana University Joint Water Resources Research Center, Bozeman, December 1975. 27 p, 1 fig, 1 tab, 23 ref. OWRT A-074-MONT(1).

Descriptors: *Rotifers, *Crustaceans, *Copepods, Plankton, Ecosystems, Zooplankton, Water quality, Biological communities, Ecology, Biota, *Montana, *Bioindicators, Lakes, Temporal distribution, Diel migration, Spatial distribution.
Identifiers: *Flathead Lake(Mont), Paleotrophic conditions.

The basic objectives were to determine the rotifer, copepod, and cladoceran fauna of Flathead Lake and to describe the diel and temporal variations of density and spatial distribution as influenced by physical, chemical, and biological features of the lake. Another objective was the recovery of records, notes, and collections of previous investigators such that irregularities in the published literature might be confirmed or corrected. Because few collections of any sort remain in the Biological Station or University of Montana museums, an attempt was made to locate museums, universities and individuals with knowledge of Flathead Lake zooplankton collections. Sediment studies have a relatively recent limnological history with studies as those of Frey (1969), Kemp (1969), Rich (1970), and St. John, Sly and Thomas (1973) revealing their value for several applications. Previous to this attempt there had been no recovery of discrete sediment samples from Flathead. These cores were analyzed for general core structure, crustacean microfossil content and a few chemical compounds. (Holje-Montana State)
W76-04235

THE BOD'S AND TOXICITY OF EFFLUENTS FROM SULPHITE PULPING FOR NEWSPRINT,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
D. J. Kubes, and A. Wong.
Water Pollution Control Directorate, Environmental Protection Service, Environment Canada, Ottawa, Canada, Technology Development Report EPS 4-WP-75-3, November 1975. 18 p, 6 fig, 9 tab, 5 ref.

Descriptors: Effluents, *Pulp wastes, Pulp and paper industry, *Biochemical oxygen demand, Toxicity, Chemicals, Fish, Mills, Reduction(Chemical), Temperature, Volume, Economics, *Sulfite liquors, Fibres, Canada, *Industrial wastes, Water quality standards.
Identifiers: Sulphite, Newsprint, Sodium-base, Wood chips, Refining, Extrapolation, *BOD5.

High yield bisulfite pulp mills, which are integrated with many eastern Canadian newsprint operations, produce acutely toxic effluents with extremely high organic loadings. Results are described of an experimental program, sponsored by Environment Canada and Carried out at the Pulp and Paper Research Institute of Canada, to measure the toxicity and five-day biochemical oxygen demand (BOD5) of laboratory-produced sodium base bisulfite pulps covering a yield range from 60 to 80%. Strength characteristics of these pulps were also determined in order to find the critical level of yield giving the pulp quality still suitable for newsprint production. Significant reductions in toxicity and BOD5 loadings are achieved by increasing pulp yield, but it is not possible to comply with Environment Canada Pulp and Paper Effluent Regulations solely by increasing yield. (Environment Canada)
W76-04245

ESTUARY STUDIES,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Programs.
For primary bibliographic entry see Field 5B.
W76-04319

IRON-INDUCED ORANGING DISEASE OF RICE IN RELATION TO PHYSICOCHEMICAL CHANGES IN A FLOODED OXISOL,
Centro Internacional de Agricultura Tropical, Bogota (Colombia).
R. H. Howeler.
Soil Sci Soc Am Proc, Vol 37, No 6, p 898-903, Illus, 1973.

Descriptors: *Rice, *Plant diseases, South America, Soils, *Iron, Absorption, Nutrients, Physicochemical properties, Toxicity, Phosphorus, Lime, Flooding.
Identifiers: *Oxisol, *Oranging disease(Rice), *Colombia.

Soil conditions associated with an oranging disease which occurs in flooded rice (Oryza sativa) grown on the Oxisols of the Llanos Orientales of Colombia were studied by measuring changes in pH, Eh (redox potential) and Fe and Mn levels in soil solutions after flooding. Rates of reduction and the build up of Fe in the soil solution vary greatly for different Llanos soils, between virgin and previously-cropped soils, and between air-dried and field-moist soils. Levels of Fe in solution could be reduced by various water management treatments and by the addition of large amounts of lime or MnO2. Oranging symptoms occur as solution Fe concentration increases and large plants were more seriously affected than small plants. Roots of affected plants were heavily coated with oxidized Fe and few active white roots formed after the increase in Fe concentration. The disease appears to be due to indirect Fe toxicity, i.e., and Fe-induced deficiency of mainly P, K, Ca, and Mg. Due to the relatively high level of Fe in solution, the roots become coated with iron-oxide reducing the root's capacity to adsorb enough plant nutrients from an already deficient environment. Under certain conditions plants may also suffer from direct Fe-toxicity, i.e., excessive Fe absorption by the plant, resulting in bronzing symptoms. A combination of direct and indirect Fe-toxicity may produce plants with a wide range of intensities of oranging symptoms and brown streaks on the leaves.--Copyright 1974, Biological Abstracts, Inc.
W76-04339

POTENTIAL HEALTH HAZARDS AND THE BURDEN OF PROOF IN ENVIRONMENTAL ACTIONS: THE IMPLICATIONS OF RESERVE MINING.
For primary bibliographic entry see Field 6E.
W76-04351

BIOLOGICAL AND WATER QUALITY EFFECTS OF ARTIFICIAL DESTRATIFICATION OF LAKE OF THE ARBUCKLES,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
D. W. Toetz.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 802, $5.00 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, December 1975. 70 p, 16 fig, 16 tab, 23 ref. OWRT A-049-OKLA(1).

Descriptors: *Biomass, *Water quality, *Destratification, Diatoms, Algae, Cyanophyta, *Growth stages, Lakes, Chlorophyll, Mixing, *Oklahoma, *Oligotrophy, *Bass, Fishing, Eutrophication, Water pollution effects, Data collections.
Identifiers: Lake of the Arbuckles(Okla), Ham's Lake(Okla), *Artificial destratification, *Species composition, Desmids, Garton pump.

The objectives were to describe changes in algal biomass, species composition, and water quality before and after artificial destratification of Lake of the Arbuckles and Ham's Lake, Oklahoma. Growth changes in fish were also described for Ham's Lake. Water quality data were obtained at stations at Lake of the Arbuckles, algal biomass estimated, and algal species identified. A small aero-hydraulics 'gun' installed in 1973 did not destratify Lake of the Arbuckles and had no effect on water chemistry. An axial downflow pump (the Garton pump) oxygenated previously anoxic water during 1974 and increased the heat budget during 1975. Water quality was very similar, however, during the period 1973-1975 and in 1968 when no destratification was attempted. Concentration of chlorophyll a (chl.a) was about the same during 1973-1975; the dominant species were diatoms, desmids, and bluegreen algae. During 1975, destratification of Ham's Lake with the G pump resulted in homothermy and an isoche distribution of O2. Both chl.a and dissolve ganic carbon were lower in 1975 than in 197 gesting the lake is becoming more oligotroph result of artificial circulation. Growth of Age II largemouth bass, Micopterus salmoides relatively constant in these years. The anglin cess rate was about one largemouth bass per an excellent catch rate. Lake mixing was an tive management tool in Ham's Lake in imp water quality. The practice had no apparent mental effect on growth or catchability gemouth bass, an important game fish.
W76-04385

BIOTIC CHANGES IN THE WILL TIC/SHETUCKET RIVER ASSOCIATED IMPROVEMENTS IN SEWAGE TREATM
Connecticut Univ., Storrs. Inst. of Resources.
W. J. Widmer, F. R. Trainor, J. D. Buck, A. Damman, and W. R. Whitworth.
Available from the National Technical In tion Service, Springfield, Va 22161 as PB-2 $4.00 in paper copy, $2.25 in microfiche. R Project Technical Completion Report, De 1975. 24 p, 1 ref, append. OWRT CONN(12). 14-31-0001-3807.

Descriptors: Sewage treatment, *Sewa fluents, *Water pollution, Activated *Municipal wastes, *Agricultural *Industrial wastes, *Chlorination, Public Aquatic microbiology, Fish populations, insects, Aquatic plants, Aquatic algae, metals, *Connecticut, *Waste water tre Bioindicators.
Identifiers: Biotic changes, River ch Ortho-phosphate, Algal assays, Microbial tors, Willimantic/Shetucket River(Conn).

Selected populations of algae, macrophy teria, fungi, invertebrates and fish were for 1 1/2 years before and after an improve sewage treatment (primary settling to sludge) at Willimantic, Connecticut. seasonal and annual changes in biotic popu nutrients and metabolic end-products indi this system receives chronic low-level i and agricultural pollution from the watershed. Minor localized effects of t ment plant effluent were observed a minimized by high dilution rates (about nually) and rapid reoxygenation in the river. The only significant changes obser (1) an increase in downstream ortho-p and (2) a decrease in downstream pollutio tor bacteria. Both results are attributed to in the sewage treatment plant, but not n due to the improvement in sewage treat se. Chlorination procedures were still re meet Connecticut public health standards ing of some industrial effluents coincide reduction in algal growth potential as mea a new assay developed during the study. presently accepted pollution indicator standards, the present status could have tained by increasing primary plant cap improving chlorination efficiency, assu river discharge patterns would continue. Connecticut)
W76-04388

PLANT NUTRIENT BUDGETS AND DISPOSAL,
Connecticut Agricultural Experiment Storrs.
C. R. Frink.
Presented at Conference on Agricult Processing Wastes in the Eastern Regio spective, Philadelphia, Pennsylvania, De 3, 1970, p 49-52, 1 tab, 5 ref.

Descriptors: *Farm wastes, *Nutrients disposal, *Nitrogen, *Phosphorus, *Co

trophication, Fertilizers, Dairy industry, er pollution effects.
tifiers: Land disposal.

of the most pressing environmental concerns onnecticut is the enrichment of lakes and ms with plant nutrients that encourage the th of weeds and algae. The nutrients responsi- or these problems may come from fertilizers, al and human waste disposal, or erosion from w housing development. The largest single ce of plant nutrients in Connecticut, excluding an waste, is dairy farming. Efficiency of ent conversion by land used in waste disposal eases as farm size decreases. Every effort ld be made in the Northeast to keep land able so that crops may utilize the applied ents more efficiently. Agronomic approaches cing nitrogen losses include application of fer- r and manure to growting crops rather than to or frozen soil, selection of crops with both yield and high protein content, increased populations, and more extensive use of crops. (Merryman-East Central)
04416

ICULTURE AND NATURE'S NUTRIENT LES,
izer Inst., Washington, D. C.
. Garman.
elationship of Agriculture to Soil and Water tion, Cornell University Conference on ultural Waste Management, Rochester, New 1970, p 11-20. 2 tab, 12 ref.

riptors: *Agriculture, *Water pollution, ogen fixation, *Photosynthesis, ophication, Ammonia, Feed lots, Nutrients, ing nutrients.
fiers: Nitrogen oxides.

synthesis and nitrogen fixation are two im- t processes, animal life would soon disap- vithout them. The objective of this research determine the effect argiculture has on na- nutrient cycles. One way that agriculture af- he nutrient cycles is its possible contribution pollution of streams and rivers. Because of rge number of variables involved and some wn factors, it is much more difficult to nine the contribution of a farm than a city or y to the pollution load of a stream. Rainfall es 0.7 ppm nitrogen. Considerably larger ts of nitrogen in such forms as nitrogen ox- nd ammonia occur in rain, near livestock ts, cities, and certain types of industrial Nitrogen oxides going into the atmosphere USA from automobile exhausts alone, and returned to land, probably exceed two mil- ns of nitrogen a year. Too often these natu- l artificial atmospheric inputs are almost tely overlooked and may end up being as- to the agricultural sector. Sufficient infor- is lacking to determine agriculture's exact ution to pollution. Several years of tedious in numerous watersheds by skilled in- ls is required to obtain this information. omists have compared major streams in ricultural regions with similar ones in vari- ricultural regions which they have studied. omparison will probably show that agricul- nd adds no more nutrients to water than ture herself. (Penrod-East Central)
422

ENCE OF AN ANTIBIOTIC ON THE RMANCE OF YEARLING HOLSTEIN S,
ota Univ., Minneapolis. Dept. of Animal .
oodrich, D. Crawford, and J. C. Meiske.
innesota Cattle Feeders' Report, Universi- innesota, Research Report B-177, p 67-71,

tors: *Antibiotics, *Performance, *Cattle. Identifiers: *Holstein yearlings, Chlortetracycline(Aureomycin), Liver abscesses.

Thirty-two yearling Holstein steers were fed a ration without chlortetracycline (Aureomycin) and 31 were fed a daily ration that contained 70 mg of chlortetracycline. Cattle fed the antibiotic gained weight about 3 percent faster (3.13 vs. 3.04 lb/day), required about 5.5 percent less feed/100 lb gain (579 vs. 613 lb) and were more profitable than steers that did not receive antibiotic in their daily ration. Fifty-three percent (17 head) of the cattle that did not receive antibiotic had liver abscesses, while 29 percent (9 head) of those that received the antibiotic had liver abscesses. (East Central University)
W76-04434

5D. Waste Treatment Processes

INCINERATION DISPOSES OF REFINERY WASTES.
For primary bibliographic entry see Field 5E.
W76-04021

SUMP DESIGN FOR OIL/WATER SEPARATORS,
Empresa Nacional del Petroleo, Concon, Chile.
J. G. Miranda.
Chemical Engineering, Vol 82, No 25, p 85, November 24, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Oil wastes, *Pumps, Sumps, *Separation techniques, Oily water, Oil pollution.
Identifiers: Refinery wastes.

The commonly used gravity-type oil/water separators require an auxiliary pump to collect skimmed oil. The skimmed oil normally contains a high percentage of nonemulsified water, which is pumped out to slop tanks if the auxiliary sump is not able to separate it. A sump design is discussed which has been used for successful separation of oil/water mixtures at the Empresa Nacional del Petroleo refinery at Concon, Chile. The sump is based on the different heights reached by columns of immiscible liquids with different densities, when brought into contact with each other. The auxiliary sump is divided into four compartments, A, B, C, and D. Compartments A and C are connected by an underflow channel beneath the partition. Overflow weirs connect compartment C to D, and A to B. When the sump is operating, water collected in A and C will rise to the top of the underflow passage and act as an oil seal. Skimmed oil and water are fed into chamber A. The water will finally be collected in compartment D, while the oil will be collected in B. Pumps send the water from D back to the main separator and oil from B to the slops. A schematic drawing of the sump system is presented. (Orr-FIRL)
W76-04022

CONTROL OF POLLUTION FROM PETROLEUM REFINERIES,
J. M. Tuli, and S. B. Sheth.
Indian Chemical Journal, No 2, p 22-29, August, 1975. 2 append.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Oil wastes, Water pollution control, Treatment facilities, Air pollution, Oil pollution.
Identifiers: Refinery wastes.

The Indian Petroleum refining industry has spent considerable research time and development efforts on pollution control. The sources of various pollutants from a petroleum refinery and the treatment facilities provided for their control are discussed. Indian standards for the disposal of industrail effluents are compated with international trends. Typical pollutants from a refinery include: oily water, sour water and process condensates containing sulfides, mercaptans, ammonia, phenols and cyanides; spent caustics; storm water; cooling tower blowdown; sanitary sewage; and, effluents from the DM water treatment facility. Spent alkalies, sour water, process condensates, and DM water plant effluents are treated before combined with the remaining effluents for common treatment. The spent alkalies are neutralized with sulfuric acid; the phenol and higher mercaptans are released and skimmed while the sulfides, mercaptans and residual phenols are stripped. Steam stripping is the most commonly used process for treating sour water. Oil/water separation is accomplished by a gravity separator. Recovered oil is returned to the refinery for processing. Chemical treatment consists of chemical precipitation with alum, ferric chloride, or aluminum chloride and lime. Biological treatment includes trickling filters, activated sludge, and oxidation ponds. Sludge is dried and used as landfill. Methods for reducing the atmospheric pollution caused by refineries are also described. (Orr-FIRL)
W76-04023

BIG REFINERY HAS ADVANCED WATER-TREATMENT UNIT.
The Oil and Gas Journal, Vol 73, No 50, p 82-83, December 15, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Oil wastes, Chemical wastes, Storm runoff, Water reuse, Separation techniques, Activated sludge, Tertiary treatment, Biochemical oxygen demand, Chemical oxygen demand, Ammonia, Microorganisms, Oil pollution.
Identifiers: Refinery wastes.

The 23 mgd waste water treatment plant recently installed at Amoco Oil Company's 344,000 b/d refinery at Texas City, Texas, is the most sophisticated refinery effluent-water quality control system in the U.S. The plant will treat waste water and storm water from the refinery and from two chemical plants. The facilities include: storage for storm flow up to 82 million gal; emergency chemical spills basin; API separators for primary treatment; staged equalization, pH control, preaeration, chemical destabilization, and filtration for intermediate treatment; two-stage activated sludge for secondary treatment; and, tertiary treatment involving filtration. Oil and grease levels will be lowered 98 percent, BOD will decrease by 86 percent, COD will decrease 83 percent, ammonia levels will be 62 percent lower. The quality of the treated water will be high enough to allow it to be reused, thus reducing the industrial freshwater demand of the refinery and chemical plants. The bacteria necessary for the purification of the wastes are kept healthy and protected from shock loads by supplying nutrients and regular monitoring of the wastes entering the plant. The facility incorporates all the elements recommended by the EPA as the best practical control technology currently available plus unique, proprietary process design and operating features by Amoco. (Orr-Firl0
W76-04024

WATER POLLUTION AND ITS CONTROL AT OIL REFINERIES,
National Environmental Engineering Research Inst. Nagpur(India).
G. J. Mohan Rao.
Indian Chemical Journal, No 2, p 15-21, August, 1975. 3 tab, 11 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Oil wastes, Water pollution control, Waste disposal, Biological treatment, Separation techniques, Landfills, Incineration, Oil pollution.
Identifiers: Refinery wastes, Physico-chemical treatment.

Water pollution control at Indian oil refineries is discussed. Topics covered include: water uses in a refinery; sources and characteristics of refinery wastes; environmental effects of refinery pollution; treatment and disposal of refinery wastes; and, Indian disposal standards. The most important methods of reducing pollution in refineries are the reduction of oil leakage by preventive maintenance of pumps, pipelines and equipment, prevention of the formation of oil emulsions, removal of floating oils in separators located as close as possible to the original source of waste, and the isolation and separate treatment of objectionable wastes by biological treatment. Physical-chemical treatment methods comprise: stripping and oxidation, combustion, solvent extraction and recovery of by-products, chemical flocculation, and air flotation. The following biological treatment methods are discussed: oxidation ponds, aerated lagoons, trickling filters, oxidation towers, activated sludge, and anaerobic digestion. Selection of the type of biological treatment to be used depends on costs and available space. Acid condensates, spent caustic solutions and spent acids can be disposed of in underground wells. Sludges are normally dewatered and disposed of on landfills, buried, or incinerated. (Orr-FIRL)
W76-04025

SUCCESSFUL COMBAT AGAINST TEXTILE WASTE WATER (ERFOLGREICH GEGEN TEXTILABWASSER).
Das technische Umweltmagazin, No 5, p 28-29, October, 1975. 2 fig, 5 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Treatment facilities, Chemical oxygen demand, Oxidation, Chemical precipitation, Flocculation, Dewatering, Color, Pulp wastes.
Identifiers: Katox treatment facility, West Germany.

The largest Katox system waste water treatment facility, built recently for the Fritz Blanke textile finishing plant at Schloetmar/Salzuflen, West Germany, is described. The facility has a daily treatment capacity of 2,400 cu m for the textile finishing waste water with COD values ranging from 600 to 1,200 mg/liter. Since biological or chemical methods are insufficient for purification and decolorization of the waste waters, the Katox system has been chosen. This system is composed of a wet catalytic oxidation stage including three aeration basins connected in series with activated carbon particles as a catalyst. This stage oxidizes most of the waste water components during intense aeration. The retention time in the catalytic oxidation stage is 3 hr. Further purification by precipitation and flocculation is performed in a second precipitation stage in which calcium hydroxide, ferrous sulfate, and flocculant aids are used. The iron hydroxides formed react with dissolved inorganic and organic substances and colloids which are thereby precipitated. Sludge with a 98 percent water content is obtained. The sludge is first dewatered to 96 percent water content by means of flocculant aids, and further dewatered to 65 percent by means of a filter press for land disposal. A residual COD value of 250 mg/liter, and essentially 100 percent decolorization are achieved. (Hamuth-FIRL)
W76-04026

APPLICATION OF OZONE TREATMENT IN THE DYEING WASTEWATER TREATMENT (SENSHOKU HAISUI SHORI NI OKERU OZON SHORI NO TEKIYO),
H. Matsuoka.
Kako Gijutsu, (Paper Converting), Vol 10, No 8, p 31-36, August, 1975. 10 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Ozone, *Dyes, Chemical oxygen demand, Biochemical oxygen demand, Color, Surfactants, Pulp wastes.
Identifiers: Disperse dyes, Hydrophilic dyes.

The general applications of ozone treatment for waste waters containing dyes include decolorization, decomposition of surfactants, and reduction of COD and BOD levels. The amount of ozone required for decolorization is higher for effluents containing disperse dyes than for wastes containing hydrophilic dyes. The weight ratio between the added ozone and dye ranges from 0.5 to one for wastes containing hydrophilic dyes but is greater than one for wastes containing disperse dyes. Disperse dyes which have higher contacting efficiency of dyes with ozone during treatment. If a pretreatment method, such as coagulation precipitation, is used prior to ozone treatment, most of the disperse dyes will be removed from the waste water. However, the removal of hydrophilic dyes cannot be accomplished by coagulation precipitation. The strong oxidizing ability of ozone permits the oxidization and decomposition of chromophoric groups in dyes, leading to the decolorization of waste water containing such dyes. The presence of reducing substances such as dithionites in waste water interferes with the decolorization of dyes because these substances will consume the ozone present before dyes can react with the ozone. Therefore, the separation of these substances prior to ozone treatment is desired. (Katayama-FIRL)
W76-04027

SOLVING TEXTILE WASTEWATER PROBLEMS: THREE CASE HISTORIES,
Sirrine (J. E.), Co., Greenville, S.C.
R. N. Tanner.
American Dyestuff Reporter, Vol 64, No 11, p 16-18, 44, November, 1975. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Treatment facilities, Design, Costs, Pulp wastes.

There are six basic steps that should be followed when designing a satisfactory treatment facility for textile wastes. The existing mill conditions should be determined by complete sampling and laboratory analyses of all waste streams. The treatment standards of existing and anticipated pollution regulations must be understood and followed. Alternative methods of treatment should be laboratory tested to determine which is the most effective. Cost studies should be performed on all technically feasible methods to establish capital, energy, chemical and manpower costs, and serve as a guide for choosing the treatment method. The facility should be designed to fulfill all the requirements. Finally, construction of the facility must be in accordance with design and specifications. A summary is presented of the development of three specific treatment facilities for wastes from a large diversified weaving mill with an integrated dyeing and finishing operation; a plant whose waste streams contained spent dye liquor, chemical and sanitary wastes; and wool scour waste from a raw grease wool processing plant. (Orr-FIRL)
W76-04028

DYESTUFF WASTES TREATMENT.
Plant Engineering and Technology, p 34, 36, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Dyes, Treatment facilities, Incineration, Activated carbon, Activated sludge, Ion exchange, Color, Chemical oxygen demand, Pulp wastes.

Mitsubishi Chemical Industries, Limited, has installed a complex combination of waste treatment technology at its Kurosaki dye plant. This plant produces about 600 types of dyes; the daily fluctuations in volume of waste water, COD levels, and COD components made treatment of the wastes extremely difficult. The new treatment, consisting of activated carbon adsorption, activated sludge, ion exchange, and waste incineration, achieves a 90 percent decolorization, and reduces the average COD level to 36 ppm. About 10,000 tons per day of waste water containing COD levels (1000 ppm) are subjected to prim coagulation sedimentation, activated sludge tr ment, secondary coagulation sedimentation activated carbon adsorption. This reduces COD levels to an average of 105 ppm. Abou tons of activated carbon are required per day. waste activated carbon is regenerated by bustion. The sludge is disposed of in a ver multistage incinerator. Ninety tons of 20,000 COD waste water are separated daily into 25 of 59,600 ppm COD and 90 tons of 2,900 ppm by ion exchange. The concentrated 25 tons ar cinerated, while the remaining 90 tons are tre by activated carbon adsorption. The treated w water is subjected to tertiary coagulation sedi tation and reused as cooling water. (Orr-FIRL)
W76-04029

PRESENT SITUATION OF ALKALI WA WATER NEUTRALIZATION EQUIPM USED FOR STACK GAS DESULFURIZAT (HAIEN DATSURYUYO ARUKARI HA CHUWA SOCHI RIYO NO JISSAI NI TSUIT
Y. Kurahashi, and K. Matsumoto.
Kako Gijutsu, (Paper Converting), Vol 10, N 566-571, September, 1975. 2 fig, 5 tab.

Descriptors: *Waste water treatment, *Indu wastes, *Textiles, Water pollution control pollution, Neutralization, Pulp wastes.
Identifiers: Alkali waste water.

The use of alkali waste water from textile i tries for the desulfurization of flue g described. Waste water from the blea process and other processes which produce alkali waste solutions can be used as the abs solution in a wet type flue gas desulfuri process. The pH of the waste water is al justed simultaneously by the desulfuri process. Waste water fed into the desulfuri process had a pH of 10-11.5, while the water had a pH of 7-8. However, the use of water in desulfurization increases the C 1000-1500 ppm as a result of the formati Na2CO3 and NaHSO2, and increase suspended solids (SS) because of the dust an components in the flue gas. This neces further treatment of the output water to r COD and SS. The output water is mixe waste water generated from non-alkali producing processes. The combined wast treated by coagulation and filtration prior t discharged into the public drainage systen operating cost for flue gas desulfurization economical if alkali waste water is (Katayama-FIRL)
W76-04030

WASTE WATER PROBLEMS OF DES WITH RESPECT TO LEGISLATIVE SURES (ABWASSERPROBLEME ENTSCHLICHTEN BERUECKSICHTIGUNG GESET BERISCHER MASSNAHMEN),
P. Gerike, P. Gode, and H. Grunert.
Melliand Textilberichte International, Vol 10, p 838-841, October, 1975. 9 tab, 12 ref.

Descriptors: *Waste water treatment, *In wastes, *Textiles, Legislation, An techniques, Pollutant identification, Bi treatment, Pulp wastes.
Identifiers: Desizing operations.

The possibilities of eliminating the individu ponents from waste waters generated in operations in the textile industry were stu model waste waters at a 1:100 bath ratio. E was placed on the parameters used for th mination of the waste water charge to be on effluents discharged from industrial without internal waste water treatment fac West Germany. The model waste waters ing potato starch, and those containing

h in combination with polyvinyl alcohol, and oxymethylcellulose, whose COD value, tox- and toxicity equivalent were determined, ed that the COD value and the volume of ended solids are chiefly responsible for the waste water charge, while toxicity is not in- d as a charge-increasing factor. Waste waters aining polyvinyl alcohol, carboxymethyl-cel- e and their combination require special treat- measures. The results indicate the possibility bstantially reducing the waste water charge echanical and/or biological treatment before arge. (Hamuth-FIRL)
04031

TE WATER PURIFICATION IN DIAZOLE DUCTION (OCHISTKA STOCHNYKH VOD ZVODSTVA DIAZOLEY),
Borodkin, T. A. Anan'eva, M. E. Al'yanov, . S. Zueva.
iya i Khimicheskaya Tekhnologiya, Vol 18, p 1286-1289, 1975. 3 fig, 2 tab, 16 ref.

iptors: *Waste water treatment, *Industrial s, *Chemical wastes, Oxidation, Catalysts, s, Water purificiation.
fiers: Diazole dye production, Catalytic ox- n.

onditions for the catalytic oxidation of the ne-zinc salt of diazotized 4-nitro-2- anisole as a model substance were studied in empt to find an optimal method for the pu- ion of waste waters containing aromatic s and their diazo derivatives, as generated in dye production processes. Sodium salts of lfonic acid of cobalt, nickel, and manganese ocyanins were found to be the best catalysts oxidation of these pollutants with air that is ed at a temperature of 70C. The duration of talytic oxidation process is 4 hr. Before ox- , the waste water is alkalized with soda to The sediment is removed by filitration, and rate is heated to 70C for catalytic oxidation. talyst concentration should be around 260 r. The purification efficiency amounts to 77 t in terms of COD reduction. (Hamuth-

4032

E/UV PROCESS EFFECTIVE WASTE- R TREATMENT,
n Research, Inc., Tex.
Prengle, Jr., C. E. Mauk, R. W. Legan, and lewes, III.
carbon Processing, Vol 54, No 10, p 82-87, r, 1975. 10 fig, 3 tab, 15 ref.

tors: *Waste water treatment, *Industrial *Chemical wastes, *Ozone, *Ultraviolet n, Oxidation, Tertiary treatment.
ers: Refractory compounds.

bined ozone and ultraviolet radiation for municipal-industrial waste water treat- as found to be effective in the chemical ox- of toxic and highly refractory compounds alcohols, acids, amino acids, fatty acids, lyhydroxyl alcohols. The process is y used in a combination secondary and/or treatment. UV radiation enhances the with ozone 100- to 10,000-fold and drives tion to completion, producing non-toxic nds such as water and carbon dioxide. A refractory index values is presented, mea- ifficulty of oxidation. Photochemical data ral refractory compounds are also pro- rocess configurations are detailed for the of mixed cyanides, for the removal of am- yanide, and organic nitrogen compounds, tertiary treatment to specifically oxidize y organics which would produce toxic nds if chlorinated. (Kramer-FIRL)
033

WASTE WATER TREATMENT BY GAS INTAKE APPARATUS (KITAI MAKIKOMISOCHI NI YORU HAISUI SHORI),
K. Fujie, T. Okawa, and N. Sakai.
Preprint, Society of Chemical Engineers, Tokyo, Japan, p 305-306, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Ozone, Chemical wastes, Water treatment, Potable water, Recycling.
Identifiers: Cyanide ions, Dibutyl sebacate.

Waste water treatment by ozone was studied using a gas intake apparatus in which the waste water is recirculated in the reaction bath and ozone is dissolved into the waste water during the recirculation period. Waste water containing 100 ppm cyanide ion was treated with 3.1 liters of ozone gas. With water circulation rates of 65 liters/min and 55 liters/min, a higher cyanide efficiency was obtained by the second rate. The cyanide concentration after 20 min of treatment was 40 percent of the initial cyanide concentration with the water circulation rate at 65 liters/min, while it was 20 percent with the circulation rate at 55 liters/min. With the faster circulation rate, more than 90 percent of the cyanide could be removed within 30 min. When the water containing 17.4 ppm dibutyl sebacate was treated with ozone, nearly 80 percent of the initial dibutyl sebacate was removed after 20 min of treatment with water circulation rates of 40 liters/min and 50 liters/min. Ozone absorption into water and the decomposition of dissolved ozone were studied using drinking water. A first-order reaction was found in the decomposition of dissolved ozone, and the decomposition reaction rate increased with increased water temperature. The adsorption of ozone by water was quite high, which is desirable because then only a small amount of non-absorbed ozone will be discharged. (Katayama-FIRL)
W76-04034

PURIFYING EPSILON-CAPROLACTAM-CONTAMINATED EFFLUENT.
German Patent DS 2344-006. Issued August 21, 1975. German Patents Abstracts, Vol W, No 35, p D2, October 7, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Biological treatment, Microorganisms, Liquid wastes, Flocculation, *Patents.
Identifiers: Metallic salts.

A method for the purification of an epsilon-caprolactum contaminated effluent has been patented. Waste liquids containing epsilon-caprolactum are treated biologically by the aerobic culturing of epsilon-caprolactam utilizing microorganisms. Pseudomonas lactamolyticus (FERM p 1520) is grown in the liquid. The pH of the cell suspension obtained is adjusted to greater than or equal to 10 with at least one slightly water soluble, alkaline calcium compound, such as calcium hydroxide, oxide or (bi) carbonate. The agglomerate is enlarged by adding at least one iron or aluminum salt such as ferrous or ferric sulfate or chloride, alum or aluminum polychloride. The addition of the calcium salt produces rapid flocculation, while addition of the iron or aluminum salt produces a readily separable consistency. (Orr-FIRL)
W76-04035

TREATMENT OF AN INDUSTRIAL WASTE WATER BY OZONIZATION (AUFBEREITUNG EINES INDUSTRIEABWASSERS DURCH OZONUNG),
H. Adelt.
Zeitschrift fuer Wasser- and Abwasser-Forschung, Vol 8, No 5, p 142-143, 1975. 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Ozone, Biodegradation, Chemical oxygen demand.
Identifiers: Total organic carbon, Trinitrotoluene production.

Experimentation concerning the ozonization of waste waters generated in trinitrotoluene production is described. Such effluents contain nitroaromatic compounds and sulfites, and are not amenable to biological degradation. Ozonization resulted in a color shift from brownish black to light orange, a reduced COD value, and, most importantly, a biodegradable effluent with a BOD5 value of 129 mg/liter. The TOC value decreased by 6 percent due to the decarboxylation of beta-oxycarboxylic acids and nitrocarboxylic acids. (Hamuth-FIRL)
W76-04036

RECOVERY AND REUSE OF TIN-NICKEL ALLOY PYROPHOSPHATE PLATING SOLUTION BY THE COMBINATION OF REVERSE OSMOSIS AND ION EXCHANGE (GYAKUSHINTO HO, ION KOKANHO NO KUMIAWASE NI YORU SUZU-NIKKERU GOKIN PIRORINSAN MEKKI EIKI NO KAISHU OYOBI SAISHIYO),
K. Koyama, M. Ishikawa, H. Enomoto, M. Nishimura, and A. Nakagawa.
Kinzoku Hyomen Gijutsu, (Journal of Metal Finishing Society of Japan), Vol 26, No 10, p 437-440, October, 1975. 7 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Reverse osmosis, Ion exchange, *Water reuse, *Recycling, Membrane processes.
Identifiers: Metal plating, Tin-nickel alloy pyrophosphate plating.

Laboratory studies were conducted on the recovery and reuse of rinse water from tin-nickel plating operations by reverse osmosis and ion exchange processes. The tin-nickel plating bath used was pyrophosphate. The rejection rate of each of Ni(2+) and Sn(2+) was not less than 99 percent by reverse osmosis with cellulose acetate membranes. The critical concentration of chemicals by reverse osmosis in practice was estimated as one half of the original bath concentration. The quality of the water passes through the membrane was high enough to allow it to be reused in the rinsing process. A deterioration in membrane performance was not observed during contact with the rinse water for 350 hrs. A suggested closed water cycle process of tin-nickel alloy plating is proposed which will effect almost complete recovery of chemicals and direct return of the concentrated product into the plating bath. (Orr-FIRL)
W76-04037

POLLUTION MEASUREMENT IN ELECTROPLATING (A PROPOS DE LA MESURE DE LA POLLUTION EN GALVANOPLASTIC),
For primary bibliographic entry see Field 5A.
W76-04038

OZONE-BASED SYSTEM TREATS PLATING EFFLUENTS,
Houston Research, Inc., Tex.
R. L. Garrison, H. W. Prengle, Jr., and C. E. Mauk.
Metal Progress, Vol 108, No 6, p 61-62, November, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Ozone, Ultraviolet light, Water reuse, Heavy metals, Chemical precipitation.
Identifiers: UVOX process, *Metal plating wastes, Cyanide ions.

Treatment of metal finishing wastes generally involves cyanide destruction. A process involving ozone has been developed, called UVOX, that completely destroys iron and nickel cyanides. A small amount of aritificially produced ultraviolet light is used to free cyanide so that it ca react with ozone. The UVOX process may be adapted for plating effluents of varying concentrations. Cyanide removal is followed by chemical precipitation

to remove all heavy metals, including cadmium, to below proposed EPA specifications. Advantages of the ozone treatment process over conventional alkaline chlorination were outlined. The UVOX process elimininates storage of toxicant, since the ozone is generated on site. The effluents treated with ozone have an increased dissolved oxygen content; undesirable odors, taste, and color are also removed. Residual waste such as phenols, sulfides and sulfites are destroyed by ozone but not by chlorine. Operating costs are substantially lower with ozone and reaction time is shorter than with chlorination. Resulting effluent quality is high enough to recycle at least 80 percent of the effluent, thereby saving on rinse water costs. (Kramer-FIRL)
W76-04039

ON THE SMALL SCALE WASTE WATER TREATMENT BY OZONE (SHOKIMO HAISUI NO SHORI NI TSUITE),
S. Suzuki, and K. Kishigami.
Sangyo to Kankyo, (Monthly Industry and Environment), Vol 4, No 9, p 51-59, September, 1975. 14 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Ozone, Biochemical oxygen demand, Chemical oxygen demand.

A summary is presented on the treatment of waste waters by ozone. Ozone treatment can be used to effect sterilization, deodorization, the decomposition of phenolics, organic compounds, cyanide ions, and ABS, and the removal of iron and manganese. The advantages of ozone treatment include: ozone is a strong oxidizing agent; a wide range of solution pH will not decrease the treatment efficiency; no secondary pollution is created by using excessive amounts of ozone; and, the amount of sludge generated is small. Ozone can be applied for the treatment of sewage, public water drainage, and various industrial wastes including food processing, pulp and paper, textile, metal plating, founding, and paint wastes. A combination of coagulation and ozone is effective if the effluent BOD and COD values are not high, however, this combination is often insufficient to treat effluents containing more than 500 ppm BOD and COD. Activated sludge in combination with ozone is effective for effluents containing high BOD, COD, and color levels. Applicationof ozone before sludge treatment will decompose substances which are inhibiting to biological activities, thus increasing the effectiveness of biological treatment. Ozone is also useful for treating plating effluents containing cyanide ions. Various metals form metal complexes with CN; most of these can be decomposed by ozone. An oxidation-decomposition of phenolic compound in wastes from founding plants is effective; the treatment and construction cost of an ozone treatment facility is more economical than for activated sludge treatment. (Katayama-FIRL)
W76-04040

WASTE WATER CONTROL IN MODERN GALVANIZING PLANTS (ABWASSERKONTROLLE IN MODERNEN VERZINKUNGSANLAGEN),
W. K. V. Gale.
Metall, Vol 29, No 9, p 941-944, September, 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Treatment facilities.
Identifiers: *Galvanizing wastes, Pickling wastes.

The modern, large-capacity pickling wastes treatment unit of the British Steel Corporation's galvanizing plant at Ebbw Vale Works, England, is described. Pickling acid is regenerated at a rate of 7.2 cu m/hr to prevent water pollution. The pickling bath to be regenerated is thickened in a prestage evaporator which is combined with a venturi scrubber, after which the semi-concentrate flows into a fluidized-bed reactor containing granulated iron oxide. Here, ferrous chloride is decomposed into ferric oxide and gaseous hydrochloric acid at 800 C. The fine oxide dust present in the hot gases is separated in a venturi scrubber, and the gaseous hydrochloric acid is absorbed in the rinse water used in the pickling line under adiabatic conditions. (Hamuth-FIRL)
W76-04041

COMPLETE RECOVERY OF ITALIAN IN-PLANT WASTE WATERS,
Smogless Italiana Spa, Milan (Italy).
G. Cominetta, and T. H. Summers.
Water and Waste Treatment, Vol 17, No 6, p 12-13, June, 1974. 1 fig.

Descriptors: *Chemical industry, *Chemical wastes, *Recycling, *Water reuse, Biological treatment, Oil wastes, Filters, Activated sludge, Treatment facilities, Reverse osmosis, Activated carbon, Costs, Industrial wastes, Waste water treatment.
Identifiers: *Flocor, Italy, *Pharmaceutical wastes.

An effluent treatment plant for the liquid wastes from a new pharmaceutical chemicals factory has been built at Nimis, Nr Udine, in northeast Italy. The plant is designed to achieve a water quality sufficient for complete recycling and reuse. The facilities incorporate chemical, physical, and biological treatment processes using Flocor as the biological filter media, with subsequent activated sludge treatment. Certain concentrated waste streams that are toxic to the biological processes are burned in an incinerator. The remaining waste water contains ammonia, chloroform, solvents, oils and greases and has a BOD ranging from 650 mg/liter to 720 mg/liter. The liquid waste first flows through a tilted plate separator for the removal of oils and greases. The pH is adjusted, flocculants are added, and the wastes are then settled. The clarified liquid is applied to a forced draught stripping tower packed with Flocool for removal of ammonia and solvents. After removal by sedimentation of the solids and passage through sand filters and activated carbon units, the water discharged is suitable for reuse in the factor. The intermittent use of reverse osmosis facilities will control any buildup of mineral salinity. (Orr-FIRL)
W76-04053

CONTROL SYSTEM TREATS DYE PLANT BRINE WASTE,
Crompton and Knowles Corp., Gibraltar, Pa. Dyes and Chemicals Div.
R. H. Horning.
American Dyestuff Reporter, Vol 63, No 8, p 32, 34, 52, August, 1974.

Descriptors: *Chemical wastes, *Brines, *Reverse osmosis, *Adsorption, *Dyes, Suspended solids, Color, Activated carbon, Filters, Industrial wastes, *Waste water treatment, Separation techniques, Pennsylvania.
Identifiers: Dye wastes.

An environmental control system has been installed at a Gibraltar, Pennsylvania, dye manufacturing plant to separate and treat a complex mixture of brine waste materials. Wastes are separated into two streams, one containing concentrated salts and the other more dilute salts. A reverse osmosis technique was rejected for treating the concentrated stream because no commercially available units were known that could achieve the very high pressure needed to filter the wastes from this plant. An evaporation technique was rejected because of the odors resulting from volatile organic materials, the tendency of mixed sulfate and chloride salts to plate out, and the need to expend large quantities of energy. Salt recovery, oxidative, biological and chemical precipitation and coagulation treatment methods were eliminated for reasons ranging from discharge requirements to the nature of the salt concentration. No suitable technique was fo for the treatment of the concentrated brine wa It was decided that it would be environmen acceptable to dispose of the wastes at a design ocean site more than 100 miles off-shore. The gon Adsorption Service carbon adsorption me was chosen to treat the dilute waste water str This system can process waste streams contai mixtures of organic material and sodium chlo some sodium sulfate, and smaller amount other inorganic materials. Both suspended and solved color are removed. The suspended m in the waste water is removed by the use diatomaceous earth pressure filter. The so color is removed by adsorption through a stage activated carbon adsorption system. FIRL)
W76-04054

PROCESS AND APPARATUS FOR CONT OUS WORKUP OF PHOSPHORUS-CONT ING RESIDUES,
Knapsack A.G., Cologne (West Germany).
H. Ebert, U. Thummler, and H. Werner.
United States Patent 3,830,039, Issued Augu 1974. Official Gazette of the United States P Office, Vol 925, No 3, p 780, August, 1974.

Descriptors: *Patents, *Phosphorus, *Che industry, *Chemical wastes, *Industrial w Chemical precipitation, Waste water treat Condensation, Filtration.
Identifiers: Yellow phosphorus.

A process and related equipment have patented for the continuous work-up of phosphorus containing residues, such as resulting from the filtration of yellow phosp or phosphorus containing effluent water. phosphorus containing residue and hot originating from phosphorus furnace ga mixed and cover the bottom portion of an e cal precipitation zone. The mixture of residu dust is in a ratio between one and two. The ing, substantially phosphorus-free resid mechanically removed from the ele precipitation zone together with the precipitated from the phosphorus furnace phosphorus/water mixture is produce vaporization of the moist residue and i passed through the electrical precipitation The phosphorus/water mixture and the du phosphorus furnace gas from the precip zone are simultaneously fed into a conde zone located downstream of the precip zone. The mixture and the dust-free phos furnace gas are precipitated in the conde zone. (Orr-FIRL)
W76-04055

LIQUID WASTE TREATMENT METHOD
R. Hatano, and M. Izumi.
Japanese Patent 49-32268, Issued August 29

Descriptors: *Patents, *Polymers, *Cl wastes, *Resins, *Flocculants, *Colloids, *Waste water treatment, Industrial wastes.
Identifiers: Rubber latex manufacturing, emulsion manufacturing.

A patented method is described that is part effective in the treatment of waste water ing colloidal polymers, produced during th facture of rubber latex and resin emulsio method is characterized by the use of poly mide in addition to the flocculant of al polychloride. The normally used floccul colloidal material require different optim levels and pre-treatment. Some of these lants are also extremely corrosive and ma sitate the construction of treatment syste special materials. In addition, the treate usually requires pH adjustment to 6-8 after lation. In the described method, al polychloride (PAC) is added to waste w rapidly stirred. Polyacrylamide powder (P

on or anion powder of 100,000 to 5,000,000 cular weight, is then added and mixed quickly evenly. After flocculation is achieved, pitation or pressure flotation is used to ate the sludge from the clear water. The ities of PAC and PAAM do not have to be ; PAC should be within 5-1000 ppm (in Al203) AAM should be about 0.1-10.0 ppm. (Seigle-)
04056

ORINE-RESISTANT FLOCCULATING NTS.
h Patent FR 2200-317, Issued May 24, 1974.
ent French Patents Abstracts, Vol V, No 25, July, 1974.

iptors: *Patents, *Mining, Pulp and paper in-y, *Flocculation, Polymers, *Waste water ent, Industrial wastes, Alkalinity, Pulp s.

ine resistant flocculating agents that are le for clarification of waste water from mills, petroleum refining and extraction g have been patented. The flocculating s are polymers with molecular weights up to ceeding 10 to the sixth power. The polymers epared by mixing 40.0-99.9 weight percent of hylamine and 0.1-60.0 weight percent of am- in an aqueous solution; 65-110 weight per- based on the dimethylamine and ammonia on) of epichlorohydrin is added over 1-40 at 25-100 degrees C; aqueous alkali metal xide is added to maintain the pH greater than until the required viscosity is achieved; the adjusted to be equal to or greater than 3.0 cid; and the product is separated. The op- range for the weight percent of ammonia is 3-30, and the optimal range for orohydrin added to 80-100. The alkali added ntain the more basic pH is sodium hydroxide e acid added to maintain the more acidic pH rogen chloride. (Orr-FIRL)
4057

IOD OF OXIDIZING FERROUS ION IN ACIDIC SOLUTION FROM THE WET ING AND MINE WASTE WATER SHIKI SEIREN OYOHI KOHAISUI SHORI OKERU SANSEI YOEKICHU NO HITETSU ION NO SANKAHOHO),
.
se Patent 49-26657, Issued July 11, 1974.

ptors: *Patents, *Mining, *Mine wastes, ated carbon, Oxidation, Iron, *Waste water ent, Industrial wastes.
iers: Ferrous ions, Wet refining wastes.

ective method for oxidizing ferrous ions in dic waste water from wet refining or mine is described. The previously known of oxidation utilized copper ion as a t and was hazardous even in small quanti- he use of chlorine and nitrogen oxide as a t was also hazardous when the quantity d a certain level. This patented method uses ed carbon contact which eliminates all the ious effects of the copper ion. Inexpensive ay be used as the activated carbon and has nown to exhibit a high catalytic effective- he activated carbon can be used repeatedly ntinuously. The method is most effective he concentration of sulfuric acid is about 4 ending on the concentration of ferrous ions olution, by controlling the quantity of car- d the reaction time, ferrous ions can be tely oxidized into ferric ions. (Seigle-FIRL)
058

IFIED BED CATION EXCHANGER REFINERY WATER-TREATMENT
,
nd Haas Co., Philadelphia, Pa.
ns.

The Oil and Gas Journal, Vol 72, No 38, September 23, 1974. 1 fig, 1 tab.

Descriptors: *Cation exchange, *Oil wastes, *Waste water treatment, Treatment facilities, *Industrial wastes, *Ion exchange, Cations, Resins, Chemicals, *Costs, Oil pollution.
Identifiers: Refinery waters.

The Torrance, California, refinery of Mobil Oil Corporation has cut the chemical cost of water treatment by using stratified-bed cation-exchangers containing both weakly acidic and strongly acidic cation-exchange resins in a single vessel. The refinery water treatment plant consists of two demineralizer systems, each including three parallel trains of cation and anion exchangers followed by mixed-bed polishing units. The physical characteristics of the weakly acidic cation-exchanger cause it to stratify itself on top of conventional strongly acidic cation-exchange resins, producing two discrete resin beds in the same vessel. In the new system the weak acid cation-exchange resin removes all cations associated with alkalinity, mainly calcium and magnesium in this plant, and produces carbon dioxide and water. The water than passes to the strongly acidic cation-exchange resin where the remaining cations of sodium and potassium are removed. The free mineral acidity caused by chlorides and sulfates is removed in the weak base anion-exchange resin; silica and carbon dioxide are removed by the strong base anion-exchanger. The effluent is further polished in a mixed-bed unit. This new system requires an amount of regenerative chemicals 20 percent less than the amount required by the older system. (Orr-FIRL)
W76-04059

BACTERIAL DEGRADATION AND EMULSIFICATION OF NO. 6 FUEL OIL,
University of Western Ontario, London. Faculty of Engineering Science.
J. E. Zajic, B. Supplisson, and B. Volesky.
Environmental Science and Technology, Vol 8, No 7, p 664-668, July, 1974. 3 fig, 6 tab, 11 ref.

Descriptors: *Oil spills, *Waste water treatment, *Microorganisms, *Bacteria, *Biodegradation, Environmental effects, Oceans, Oil pollution, Oil wastes.
Identifiers: *No. 6 fuel oil, Paraffinic hydrocarbons.

The treatment of surface water oil spillage with the use of microorganisms to degrade the oil was studied. Bacterial cultures which metabolized the paraffinic hydrocarbons present in No. 6 fuel oil and converted these paraffinic hydrocarbons into emulsifying agents were isolated from sewage. During biodegradation the small molecular weight hydrocarbons in the oil were metabolized and there was a reduction of the saturate fraction. The asphaltenes and resins fractions of the No. 6 oil were resistant to the microbial action. The extracellular emulsifier produced from the paraffinic hydrocarbons appears to be a high-molecular weight polysaccharide. Low temperatures and high salt levels act as inhibitors to the emulsification process of the bacteria but only slightly affect the activity of the extracellular emulsifier. The extracellular emulsifying agent can be produced in the laboratory and added in pure form to emulsify oil under stressful environmental conditions such as those present in an open ocean spill. (Orr-FIRL)
W76-04060

EFFLUENTS CONCENTRATION.
Soviet Patent SU 402517. Issued January 28, 1974.
Soviet Inventions Illustrated, Vol. V, No. 30, p D4, September 3, 1974. 1 fig.

Descriptors: *Patents, *Oil wastes, Effluents, *Evaporation, Centrifugation, *Waste water treatment, Industrial wastes, Oil pollution.
Identifiers: Multi-stage evaporation.

A method for the concentration of effluents from petroleum treatment plants has been patented. It involves multi-stage evaporation using an inert, solid heat transfer agent, such as metal shot or granite chips. To accelerate the process and raise the degree of concentration of the effluent, the inert pre-heated transfer agent is placed in the discharge before the evaporation stage. The process starts with the heating and softening of clarified waste. The treated waste is then boiled and fed into the primary stage of a multi-stage evaporator. After passing through the various stages, the salt concentration reaches four to seven percent. Further evaporation to supersaturation occurs in another evaporator heated to 500 C by the solid heat transfer agent. The metal shot or granite chips are heated in a furnace and then gravity fed to the evaporator. The concentrated liquid is sent to a crystallizer and then to a centrifute. The last stage evaporate is removed by a thermocompressor for use as a heat transfer agent. (Orr-FIRL)
W76-04061

REFINERY PIONEERS COMBUSTION, COOLING.
Modern Power and Engineering, Vol 68, No 8, p 40-43, August, 1974.

Descriptors: *Oil wastes, *Industrial wastes, *Design criteria, *Treatment facilities, Water reuse, Waste water treatment, Desalination, Operation, Recycling.
Identifiers: Refineries, *Air cooling, *Combustion.

Gulf Oil Canada Limited's Oil refinery at Point Tupper, Nova Scotia, has successfully operated for four years with the help of technologically advanced engineering innovations. Features of the plant include substantial fuel savings, increased process efficiency, low excess air firing, air cooling, extensive pollution control for both air and water, and all-electronic instrumentation and operation. Total air cooling of the plant has eliminated the need for cooling towers and the use of toxic chemicals associated with cooling towers. The amount of fresh water required has also been reduced. The waste water treatment process includes extensive water reuse. Foul water is treated by stripping, flashing of desalter brine into a two-compartment vessel, and subsequent sand filtration. Advantages of this system include reuse of flashed steam from the desalter brine, elimination of the need for quench water to cool the brine, reuse of stripped foul water as desalter wash water, and removal of silt particles through sand filtration which would otherwise tend to stabilize the oil in water emulsion. Vortometric burners used at the plant burn many liquid fuels at high efficiency, achieve almost complete and smokeless combustion, decrease atmospheric pollution, and require minimal operator attention and mechanical maintenance. (Orr-FIRL)
W76-04063

AEROBIC TREATMENT OF TEXTILE WASTES,
Nalco Chemical Co., Chicago, Ill. Nalco Consulting Services.
M. R. Purvis.
American Dyestuff Reporter, Vol. 63, No. 8, p 19, 22, 24, 26, August, 1974. 1 tab.

Descriptors: *Industrial wastes, *Waste water treatment, *Aerobic treatment, *Biological treatment, Anaerobic conditions, Textiles, Equipment, Pulp wastes.
Identifiers: *Textile wastes.

A combination of methods for the treatment of aqueous wastes is often necessary to effectively remove pollutants, especially when treating textile wastes containing substances which may or may not be biodegradable, non-biodegradable, or toxic. Due to economic considerations, Maximum use

must be made of biological processes rather than chemical or physical methods. Optimum benefits must be obtained from the degradation performed by the microorganisms. To maintain effective biological water treatment, the peculiarities of the water being treated, the mechanics of the equipment being used, and the principles of biological treatment must be understood. A brief description of biological treatment processes is presented, including both anaerobic and aerobic procedures. The basic principles necessary to provide for healthy biological growth are: the presence of soluble carbonaceous material with a biochemical oxygen demand; the presence of oxygen for microbial respiration (in an aerobic situation); a pH between 5.5 and 8.5; the presence of sufficient nitrogen and phosphorus for synthesis of cellular material; a waste stream equalized in terms of hydraulic loading, waste composition, and temperature; the presence of micronutrient elements; adequate detention time in aeration chambers; and adequate facilities for solids/liquid separation. Problems common to aerobic treatment systems and their causes are also briefly discussed. (Orr-FIRL)
W76-04064

METHOD AND APPARATUS FOR CLEANING WASTE LIQUID CONTAINING DILUTED DYE,
Kanebo Ltd, Tokyo (Japan). (Assignee).
S. Oohara.
United States Patent 3,829,380. Issued August 13, 1974. Official Gazette of the United States Patent Office, Vol. 925, No. 2, p 605, August, 1974. 1 fig.

Descriptors: *Dyes, *Patents, *Waste water treatment, *Absorption, Liquid wastes, *Cleaning, Industrial wastes.
Identifiers: Polyamide fibers.

A method and apparatus for cleaning waste liquids which contain diluted dyes have been patented. The apparatus is an absorption column containing polyamide fibers which have a high diluted dye absorption coefficient of at least 0.5 and at least 150 meq/kg of amino group. The liquid waste stream containing dilute anionic dyes or disperse dyes is cleaned by its circulation through the absorption column. The cleaned liquid is then returned to the dyeing system for the next process. (Orr-FIRL)
W76-04065

WASTEWATER PURIFICATION IN THE SYNTHETIC FIBER PRODUCTION. EXPERIENCES GAINED WITH A BIOLOGICAL WASTEWATER TREATMENT PLANT (REINIGUNG VON ABWAESSERN AUS DER CHEMIEFASERPRODUKTION. ERFAHRUNGEN MIT EINER VOLLBIOLOGISCHEN KLAERANLAGE),
R. Wingerter, and I. Neff.
Chemische Industrie, Vol 26, No 8, p 498-500, August, 1974. 1 fig.

Descriptors: *Textiles, *Industrial wastes, *Waste water treatment, *Biological treatment, Biochemical oxygen demand, Activated sludge, Aerobic conditions, Cooling towers, Treatment facilities, *Fiber(Plant), *Pulp wastes.
Identifiers: Nylon manufacturing, Dacron manufacturing, Germany.

A modern biological waste water purification plant at a Du Pont de Nemours plant manufacturing nylon and dacron fibers at Uentrop, Germany, is described. The waste water, with a BOD load of 400-100 mg/liter and a COD level of 700-2000 mg/liter, is mixed and aerated by means of Kenics mixers. This results in a BOD reduction by 20.2 percent. The mixed waste water is then sent to the biological treatment plant with surface aerators where the efficiencies of BOD and COD removal are 95-99.5% and 92-99%, respectively. To compensate for the reduced degradation efficiency at low temperatures, the dry matter content is increased from 5-6 g/liter to 8-10 g/liter in winter. Phosphoric acid and ammonia are added to the waste water for the microorganisms. Following separation of the activated sludge in a separate basin, the excess sludge is subjected to aerobic stabilization. The purified water has further application in cooling tower systems. (Takacs-FIRL)
W76-04066

TREATMENT OF SILK SCOURING WASTE WATER BY ACTIVATED SLUDGE PROCESS (KEN SEIREN HAISUI NO KASSEI ODEI SHORI),
Osaka Univ. (Japan). Faculty of Engineering.
Y. Maeda, Y. Mizobuchi, K. Suga, and K. Ichikawa.
Hakko Kogaku Zasshi, (Journal of Fermentation Technology), Vol. 52, No. 9, p 683-688, 1974. 12 fig, 2 tab, 8 ref.

Descriptors: *Activated sludge, *Waste water treatment, Flocculation, Organic compounds, *Industrial wastes, Chemical oxygen demand.
Identifiers: *Acidification, *Silk scouring wastes, Sulfuric acid, Chemical pretreatment.

Investigations were performed on the chemical pretreatment and the activated sludge treatment of silk scouring waste water. Pretreatment consisted of acidification by the addition of sulfuric acid solution to the waste water. The floc formed from the acidified waste water was found to have an optimum pH range for flocculation of 3.0-3.5 and to contain as organic substances a nonionic surfactant used in the scouring process and sericine from the raw silk. Removal of the settled floc resulted in about a 50% reduction of the COD(cr) of the waste water. Activated sludge treatment of the pretreated waste water was conducted after neutralization with sodium hydoxide solution. The results of a batch test showed that activated sludge acclimated to the waste water for one month exhibited the best growth on waste water with 40 ppm monobasic potassium phosphate added, and had an optimum pH of 8.6, an optimum temperature of 36 C, a maximum specific growth rate of 0.12 per hour, a yield constant of 0.39 for COD(cr), a saturation constant of 296 ppm for COD(cr), and an autoxidation coefficient of 0.118 per day. A continuous test was carried out at a dilution rate of 0.125 per hour, MLSS concentration of 2600 ppm, and a COD(cr) loading range of 0.69-2.0 kg/kg/day. Eighty percent of the COD(cr) of the chemically pretreated waste water was reduced in the continuous test and the sludge volume index was consistently around 80 ml/gram. It was suggested that the silk scouring waste water contains COD(cr) components which are resistant to biodegradation, such as detergents. (Orr-FIRL)
W76-04067

OXIDISING FOUL-SMELLING SUBSTANCES IN WASTE WATER.
Netherlands Patent NL 7402-174. Issued August 21, 1974. Derwent Netherlands Patents Reports, Vol. V, No. 36, p D3, 1974.

Descriptors: *Patents, *Odor, *Food processing industry, *Industrial wastes, *Oxidation, Plastics, Weirs, Recycling, *Waste water treatment.

A patent has been issued for the purification of waste water by the oxidation of malodoraous substances. The waste water is circulated through an installation which contains a number of swill grids composed of many small capillary tubes. The capillary tubes, which may be made of a plastic material, are welded together, cut into segments, and then held in a frame. The depth of water on the grids is controlled by a weir and the air necessary for processing the waste water is blown upwards through the capillary tubes. The grids can be placed in batteries one above the other in a closed vessel or they can be offset in terraces. The water passes through successive stages of treatment and recycled if required. This method is suitable for the treatment of waste water from food processing and related industries. (Orr-FIRL)
W76-04068

TREATMENT OF LIQUID WASTE FROM S BEAN FOOD PROCESSING PLAN (RECOVERY OF SOYBEAN CURD BY ME BRANE OSMOSIS) (DAIZU SHOKUHIN SEI KOJO NO HAISUI NO SHORI (SAIZU NYUS NO MAKUTOKAHO NI KAISHU)),
D. Nomura.
Mizu Shori Gijutsu, (Water Purification Liquid Waste Treatment), Vol 15, No 7, p 75 July, 1974. 5 fig, 2 tab, 18 ref.

Descriptors: *Food processing industry, *W water treatment, *Filtration, Reverse osmo Proteins, Recycling, Activated sludge, Li wastes, Biochemical oxygen demand, Memb processes, Soybean.
Identifiers: Ultrafiltration, *Soybean bo water.

Soybean boiling water discharged from soyb processing factories contains an average of 30, 40,000 ppm BOD, or a total BOD load of 60-8 per ton of beans. When ultrafiltration was use treat these waters, the concentration recover protein was satisfactory but the removal of was not successful. Reverse osmosis was teste a possible solution. The relationship betwee effluent concentration and the osmosis flow observed, and it was found that an increase of centration greatly decreased the osmotic flow. concentration limit was determined to be a 4%, which produced 4 gfd; a 2% effluent prod 10 gfd; and 10 percent, zero. The cause of the BOD was the sugar content in the waste wat G-10T membrane produced by the Bioengine Company could be used to separate 60-70% o sugar. However, more than half of the separated consisted of high molecular elemen above 10,000 and the low molecular sugar required reverse osmosis with a special brane. A two step method has been develop the United States for this purpose. The first s the elimination of the protein concentration trafiltration (Abcor HFA-180); the second st the removal of the sugar concentration by re osmosis with Abcor AS 197. The remaining molecular substances causing high BOD treatable by activated sludge methods. (S FIRL)
W76-04069

FILTRATION TECHNOLOGY ROUND-UP.
Food Manufacture, Vol 49, No 7, p 41, 44, 4 July, 1974. 11 fig.

Descriptors: *Food processing ind *Separation techniques, *Filtration, *Waste treatment, Filters, *Waste water treatment.
Identifiers: Filter presses, Vacuum drum f Cartridge filters.

The food industry relies on filtration for types of liquid/solid separation, from the re of fine suspended matter in beverages, th separations where both filtrate and residue a portant, to separations where only the solid is desired. A report is given on the trends a plications of filters in food manufacturing cially in the area of effluent treatment. The of filters discussed include: vacuum drum used when the filter cakes produced are pressible; filter presses used when the liquid is volatile or the filter cake is incomp ble; and, cartridge filters used when very quantities of solids above a certain size are removed. Variations in these three types of as produced by different manufacturers a discussed. (Orr-FIRL)
W76-04070

EQUIPMENT FOR THE UTILIZATIO SALT-CONTAINING WASTE-WA GENERATED IN METALLURGICAL PL

ANOVKA DLYA UTILIZATSII SOLENYKH CHNYKH VOD METALLURGICHESKOGO ODA),
Yurkin, N. I. Tabachnik, and V. I. Tkach.
snabzheniye i Sanitarnaya Tekhnika, No 5, p , 1974. 2 fig.

iptors: *Recycling, *Metals, *Industrial s, *Waste water treatment, *Powerplants, oration, Salts.
fiers: *Dissolved inorganic salts recovery, lurgical plants, Cold strip mill wastes.

thod for the recovery of dissolved inorganic rom waste waters generated by metallurgical such as a cold strip mill is described. Two ent types of waste waters, both containing ulsions with different sodium and calcium ncentrations are obtained. The waste waters vaporated by power plant steam in two te cycles. The distilled water obtained is ed in the technological process, while the ration residues are fed into a cyclone fur- o destroy the organic residue and to dry the nic salts. (Takacs-FIRL)
4071

ER ETCHANT EFFLUENT TREATMENT,
Roy.
d States Patent 3,816,306. Issued June 11, Official Gazette of the United States Patent , Vol. 923, No. 2, p 678-679, June, 1974. 1

ptors: *Copper, *Metals, *Industrial s, Effluents, Hydrogen ion concentration, e water treatment, *Patents.
iers: Copper etchant effluents, Hydrogen de.

nt has been issued for a process designed treatment of copper etchant effluents. This s can reduce the copper content of an aque- fluent which contains the rinsings from the gs of copper containing substrates to less ppm. The procedure includes: adjusting the the effluent to < or = to 4; adding to the ef- while vigorously agitating, hydrogen perox- d a water soluble compound such as calcium e; and adding to the reaction mixture an al- material such as lime or a water soluble salt onic acid in the amount required to adjust to at least 8. (Orr-FIRL)
4072

VERY OF FELDSPAR AND GLASS SAND GEORGIA WASTE GRANITE FINES,
of Mines, Tuscaloosa, Ala. Tuscaloosa rgy Research Lab.
Eddy, E. W. Collins, and G. V. Sullivan.
of Investigations 7928, 1974. 11 p, 1 fig, 12

tors: *Waste water treatment, *Industrial *Mining, *Flotation, Iron, Separation ues, Georgia.
ers: *Feldspar recovery, *Quartz y, Waste granite fines.

tory batch- and small-scale continuous n processing tests were performed on granite fines from Georgia. These deter- he feasibility of recovering usable feldspar artz products by flotation. Two flotation s were utilized for the removal of biotite er iron-bearing minerals: one was in an ionic circuit, while the other was in an al- nionic-cationic circuit. Feldspar was ed using an acid-cationic method. Continu- tation processing yielded a commercial- eldspar concentrate. About 42% of the vas recovered at glass sand specifications. ctive separation of potash feldspar from k feldspar concentrate was achieved by flotation in a mineral separation cell. r-FIRL)
073

IDENTIFICATION AND DETERMINATION OF 1,4-BENZOQUINONE IN WASTE WATER OF THE COAL WORKING INDUSTRY (ZUR IDENTIFIEZIERUNG UND BESTIMMUNG VON 1,4-BENZOCHINON IN ABWAESERN DER KOHLEVERARBEI- TENDEN INDUSTRIE),
For primary bibliographic entry see Field 5A.
W76-04074

LEACHING OF POLLUTANTS FROM WOOD-CHIP SLURRY,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
T. Asano, A. L. Towlerton, and R. L. Sanks.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 100, No. EE4, p 855-867, August, 1974. 18 fig, 2 tab, 5 ref.

Descriptors: *Leaching, *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Wood wastes, Pipelines, Water pollution sources, Water reuse, Slurries, *Pulp wastes.
Identifiers: Hydraulic pipelines, Wood chip transportation.

The pulp and paper industry has been investigating the possibility of using hydraulic pipelines to transport wood chips to processing plants. A major factor affecting the feasibility of this transport is the effect of substances leached from wood chips into the carrier water during the transit period. The economic feasibility of wood-chip pipelines is affected by the possibility of using carrier water in the pulp mill, cost of treating the polluted carrier water, and the cost of corrosion-resistant pipe material. The concept of reuse rather than treatment is stressed. Tests showed that carrier water is unfit for use in the pulping process without treatment to remove foaming characteristics and COD. However, the best solution for disposal of the wood-chip carrier water would be its utilization in the pulping process. Otherwise, it will add to the hydraulic load of the mill. Further research is planned on the accurate prediction of pollutants in prototype pipelines. (Kramer-FIRL)
W76-04075

PULP MILL GETS ITS OWN OXYGEN GENERATOR.
Chemical and Engineering News, Vol. 52, No. 29, p 15-16, July 22, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Wood wastes, Oxygen, Odor, *Pulp wastes, Virginia.
Identifiers: Air separation plant, *Oxygen production, Pulp bleaching.

On-site produced oxygen in wood pulp manufacture has been used at the Chesapeake Corporation of Virginia's pulp mill at West Point, Virginia. Oxygen is produced at an air separation plant with a capacity of 100 tons per day of oxygen. The oxygen is used for three processes at the mill: one step in pulp bleaching; secondary waste water treatment; and treatment for minimizing odor during black-liquor chemicals recovery. This is the first oxygen unit supplied to the paper industry. The unit uses a conventional low-pressure cycle with molecular sieve cleanup of the air ahead of cooling to remove moisture and carbon dioxide. This waste water treatment method replaced trucked-in oxygen. (Kramer-FIRL)
W76-04076

CHLORINATION OF SULPHATE PULP AT HIGH TEMPERATURE,
Swedish Forest Products Research Labs. Stockholm.
H. Norrstrom, and G. Akerlund.
Pulp and Paper Magazine of Canada, Vol. 75, No. 6, p 67-70, June, 1974. 9 fig, 2 tab, 17 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Chlorination, Closed conduits, Temperature, Biochemical oxygen demand, *Sulfates, Chemical wastes, *Pulp wastes.
Identifiers: Closed water systems, Hemi-cellulose.

Closing of the water system in a kraft pulp mill increases the overall system temperature and the chlorination stage temperature. This results in hemi-cellulose degrdation and reduced yield. However, the addition of 0.5% C102 (as active C12) to the chlorination stage retards these effects. Studied were made on the chlorination of a pine sulfate pulp at temperatures up to 50 C with and without the addition of C102. As a consequence of adding C102 to the process, BOD7 discharge was also reduced. Delignification, in contrast, was unaffected by the C102 addition. (Kramer-FIRL)
W76-04077

INDUSTRIAL WASTEWATER: JOINT OR SEPARATE TREATMENT. (INDUSTRIEEL AFVALWATER: SANERING OF ZUIVERING.).
F. J. Van der Schot.
Voedingsmiddelentechnologie, Vol. 7, No. 21/22, p 17, 19, 21-23, May, 1974. 1 fig, 2 tab.

Descriptors: *Food processing industry, *Industrial wastes, *Municipal wastes, *Waste water treatment, Biochemical oxygen demand, Flocculation, Biological treatment, Costs, Economics, Activated sludge, Pre-treatment(Water).
Identifiers: *Municipal-industrial wastes.

Alternatives for choosing joint or separate treatment of industrial and municipal waste waters are discussed with special regard to the food processing industry. The increasing price of water supply and the increasing tariffs on waste water discharged into the communal network will induce more industries, especially the large ones, to switch to an internal water supply or waste water purification, and possibly a combination of both. Such internal waste water treatment plants should be designed with respect to the BOD load which is usually high in waste waters generated in the food processing industry, as compared with that of municipal waste waters. Pre-treatment, preliminary settling, oxidative biological purification either in oxidizing beds or activated sludge tanks, and final settling of the flocculated pollutants are the basic stages of the industrial waste water treatment. (Takacs-FIRL)
W76-04078

EXPERIENCES WITH THE OPERATION OF STEP SWING GRATES, AND PLANS FOR THE COMBINED INCINERATION OF DOMESTIC REFUSE AND SEWAGE SLUDGE (BISHERIGE BETRIEBSERFAHRUNGEN MIT STUFENSCHWENKROSTEN UND PLANUNGEN FUER KOMBINIERTE VERBRENNUNG VON MUELL UND KLAERSCHLAMM),
B. Pauli.
VGB Kraftwerkstechnik, No. 5, p 332-335, May, 1974. 6 fig.

Descriptors: *Industrial wastes, *Domestic wastes, *Incineration, *Waste water treatment, Waste disposal, Sewage sludge, *Sludge treatment, Equipment.
Identifiers: Municipal-industrial wastes, Step swing grates.

Experiences with the operation of step swing grate firings and their possible use for the joint incineration of domestic refuse and sewage sludge are presented. Step swing grates provide for the necessary stirring and motion of the material being incinerated and are especially suitable for the incineration of pasty, sticky materials and as material which is transformed into a sticky mass while being incinerated. Successful experiments with the incineration of sewage sludge with water contents ranging from 45 to 80% alone or together with domestic refuse were conducted in step swing

grate firings. Autonomous combustion of sewage sludge with 45-50% water content and a calorific value of 25000 kcal/kg was achieved using such firing equipment. (Takacs-FIRL)
W76-04079

JOINT TREATMENT VERSUS PRETREATMENT OF FOOD-PROCESSING WASTES,
Kraftco Corp., Glenview, Ill.
K. S. Watson, H. I. Goldsmith, and R. F. Pico.
Journal Water Pollution Control Federation, Vol. 46, No. 8, p 1927-1938, August, 1974. 7 fig, 5 tab, 6 ref.

Descriptors: *Food processing industry, *Biological treatment, *Waste water treatment, *Municipal wastes, *Industrial wastes, Operation, Treatment facilities, Pre-treatment(Water).
Identifiers: *Municipal-industrial wastes.

The use of a joint approach to treating industrial discharges compatible with municipal waste water is significant for the dairy industry, because many of the plants are small and almost all of them are connected to municipal systems. The principal reasons for joint treatment are: the least number of biological treatment plants will be required; treatment in a smaller number of plants will give a lower treatment cost for the total community; using larger, city operated plants will more likely assure the professional operation of treatment facilities; and, no pre-treatment of dairy processing wastes will be necessary. Details from the Lowville, New York, and the Champaign, Illinois, plants are given. The Lowville plant demonstrated joint treatment and showed that even in a small, relatively simple community system, in which dairy plant wastes exceed 50% of the total load, the joint approach was a mutually beneficial one. The Champaign plant was forced to provide pre-treatment facilities and demonstrated that this approach was not beneficial to the community or to the plant. Operating experiences at both plants indicated that dairy plant wastes are readily treatable in a biological treatment plant and that the edible fats, oils, and greases can be handled without problems in a municipal treatment plant. (Kramer-FIRL)
W76-04080

KRAFT EFFLUENT COLOR NATURE BEFORE AND AFTER LIME TREATMENT,
Institute of Paper Chemistry, Appleton, Wis.
H. S. Dugal, R. M. Leekley, and J. W. Swanson.
Paper Trade Journal, Vol. 158, No. 37, p 39-40, September 16, 1974.

Descriptors: Pulp and paper industry, *Waste water treatment, *Industrial wastes, Color, Lime, Ions, Metals, *Pulp wastes.
Identifiers: *Lime treatment, Kraft mill effluents, *Color removal, Polyvalent metal ions.

A study was made by the Institute of Paper Chemistry for the Environmental Protection Agency on the color of kraft effluent before and after lime treatment. The project was concerned with the chemical and physical characterization of color bodies in mill effluents, and with the lime treatment of effluents in the presence of multivalent ions. Kraft mill effluents were studied before and after two types of lime treatment, massive and stoichiometric. Massive treatment was found to be more effective on caustic extract than on decker effluent, while stoichiometric lime treatment proved to be more effective on decker than on NSSC effluents. Over 50% of the color left by conventional lime treatment processes was removed by incorporating polyvalent metal ions with lime. Metal ions and lime together were more effective color removing agents than either agent alone. (Kramer-FIRL)
W76-04081

PURIFICATION OF WASTE WATER FROM STYRENE BEAD POLYMER PRODUCTION,
Badische Anilin und Soda-Fabrik A. G., Ludwigshafen am. Rhein (West Germany). (Assignee).
H-G. Keppler, L. Zuern, and E. Stahnecker.
United States Patent 3,829,378. Issued August 13, 1974. Official Gazette of the United States Patent Office, Vol. 925, No. 2, p 604, August, 1974.

Descriptors: *Patents, *Chemical wastes, Chemical industry, *Waste water treatment, *Polymers, Flocculation, *Industrial wastes, Water purification.
Identifiers: Styrene bead production wastes, Persulfates.

A waste water purification process for water from styrene bead polymer production was patented. Vinyl pyrrolidone polymers or vinyl alcohol polymers are used as suspension stabilizers. The process consists of treating the waste water at 70 to 180 C with 0.02 to 5.00 percent by weight of the persulfate of sodium, potassium, or ammonium. The suspended matter is flocculated by this method. (Kramer-FIRL)
W76-04083

RECYCLING AND RECLAMATION--FACT OR LIP SERVICE.
Polymers, Paint and Colour Journal, Vol., 164, No. 3876, p 641, 643, July 31, 1974.

Descriptors: *Recycling, *Waste water treatment, *Chemical wastes, *Polymers, Plastics, Energy, Costs, Solvents, Research and development, *Water reuse.
Identifiers: Plastics recycling.

An investigation was conducted on the techniques adopted in the recycling and reclamation of a wide range of materials employed in the polymer-using industries in Great Britain. A number of large custom processors of solvents responded that they were using well established techniques and were not actively concerned with recycling and reclamation research. More research should be conducted in connection with more sophisticated waste; plastics are of priority consideration. A symposium organized by Corporate Development Consultants on the role of recycled plastics was held to provide a platform for presentation and discussion of the current world wide material shortages and rising energy costs. (Kramer-FIRL)
W76-04084

SCP PRODUCTION FROM SPENT SULPHITE LIQUOR (ARYUSAN PARUPU HAIEKI YORI NO SCP NO SEISAN),
Y. Tsutsui.
Journal of the Japanese Fermentation Association, Vol 32, No 7, p 278-286, July, 1974. 3 fig, 17 tab, 30 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Recycling, *Cellulose, *Yeasts, *Sulfite liquors, Fibers(Plant), Lime, Centrifugation, *Waste water treatment, Water reuse, Fermentation.
Identifiers: SCP yeast production.

Pulp liquor can be used for the production of SCP yeast. This includes sulfite liquor from the manufacturing of rayon and synthetic fiber, and utilizes wood cellulose and hemicellulose sugar. Wood is digested and a liquor is emitted at a temperature of 85-90 C and pH of 1.8-2.5. The liquor is sent to a storage tank, and lime is added to eliminate sulfur dioxide which inhibits yeast formation. Sulfur dioxide is partially eliminated in the form of calcium bisulfite. Various nutrients can be added or it can be treated by steam stripping. When no nutrients are added, the liquor is cooled in a neutralization tank packed with limestone and continuously sent to the fermentation tank. Nutrients added as nitrogen sources include ammonia, urea, ammonia sulfate, potassium chloride, magnesium sulfate, and phosphorus pentoxid
Yeast is multiplied in the liquor by its carbon a
supplementary nutrients; the liquor produc
much foam by the remaining lignin sulfonic ac
surfactant. The foam is then eliminated by t
Waldhof fermentator and its spinner by centrifug
action. From the fermentation tank, yeast
separated and is passed to a cream tank. It
cooled, dried, crushed, sifted, and becomes a u
ble product. (Seigle-FIRL)
W76-04085

**TREATMENT OF WASTEWATERS FRO
CARBAMIDE RESIN PRODUCTI
(OCHISTKA STOCHNYKH VOD OT PRO
VODSTVA KARBAMIDNOY SMOLY),**
A. B. Tsfasman, G. I. Fishman, I. D. Pevzner, Y
A. Glotova, and L. N. Yankovskaya.
Vodosnabzheniye i Sanitarnaya Tekhnika, No
12-13, 1974. 3 fig, 1 tab, 8 ref.

Descriptors: *Chemical industry, *Chemi
wastes, *Waste water treatment, Alkalini
Chemical precipitation, Resins, *Indust
wastes, Ureas.
Identifiers: *Carbamide resin producti
Methylene urea, Sulfuric acid, Sodium hydroxi

A chemical method for the removal of resin f
waste waters generated in carbamide resin prod
tion is presented. Waste water containing ab
20-30 g resin per liter is combined with urea
rate of 1.2 grams per gram of resin, and with
furic acid up to a final concentration of 5 g/l
The precipitation is most efficient in a pH rang
1-2. After the waste water containing urea and
furic acid is allowed to stand for 4 hours,
neutralized with sodium hydroxide added in
necessary quantity to achieve a slight degree o
kalinity. The methylene urea output amount
110% of the initial resin content. (Takacs-FIRL
W76-04086

PROCESS FOR TREATING ALDEHYDES,
Asabi Kasei Kogyo Kabushiki Kaisha (Jap
(Assignee).
S. Ishida, N. Oshima, K. Kurita, I. Suzuki, and
Ohno.
United States Patent 3,829,379. Issued Augus
1974. Official Gazette of the United States P
Office, Vol 925, No 2, p 604, August, 1974. 1 f

Descriptors: *Chemical wastes, *Waste
treatment, Sulfites, Metals, Ammonium,
tivated sludge, *Industrial wastes, *Patents.
Identifiers: *Aldehydes.

A process for treating aldehydes has
patented. A gas or solution containing aldeh
such as formaldehyde may be contacted w
sulfite of alkali metals with ammonium or
mixture of 100 to 5 percent by weight of the
and 0 to 95 percent by weight of the bisulfite
kali metals or ammonium. The pH of the treat
system is kept at 6 to 11. The resulting sol
may also be subjected to activated sludge
ment. (Kramer-FIRL)
W76-04087

**RECYCLING OF WASTE IN THE MEA
DUSTRY,**
Hellaby Shortlant Ltd. Auckland, New Zeala
G. A. Corban.
Food Technology in New Zealand, Vol 9, N
24-25, 27, 29, June, 1974.

Descriptors: *Food processing industry,
reuse, *Sewage treatment, *Waste water
ment, Biochemical oxygen demand,
*Recycling, Industrial wastes, Suspended
Treatment facilities.
Identifiers: *Meat industry, New Zealand,
audits, Flocor.

ethods for the treatment of sewage and the
f water, especially in the meat industry,
een explored. The incentive for investiga-
the waste water situation in the Shortland
Auckland, New Zealand, was the in-
in costs of sewage and water. The Short-
orks approached the problem by instituting
audit in each department. The audit con-
f nine questions; the answers to these
the use and possible reuse of water within
t. The main treatment at the plant was the
Tower process. In this process, the degree
and solids removal was proportionate to
of feeding or recirculation. One pass of a
ough the tower removed 33% of the BOD.
possible to remove 80% of the BOD by
four passes through the tower or by using a
ent:influent mixture. (Orr-FIRL)
088

MINE DRAINAGE WATER MADE FIT
NK.
Works, Vol. 105, No. 9, p 120, September,

ors: *Acid mine water, *Potable water,
water treatment, *Ion exchange, Sulfates,
Mine acids, Drainage, Water treatment,
n, Resins, Pennsylvania.
rs: Amberlite ion exchange resins.

k Run plant at Philipsburg, Pennsylvania,
nodified Desal ion exchange process to
acid mine drainage into potable water. The
ocesses 800,000 gpd and expects to be
g one million gpd by the end of the year.
inage problems result from the chemical
on between metal sulfates associated with
osits, and with air and water. The Desal
utilizes Amberlite ion exchange resin
hich exchange carbonates for sulfates.
r is then treated by aeration, neutraliza-
ening, and filtration. (Orr-FIRL)
90

AL OF PHENOLS FROM WATER.
Patent BE 807-425. Issued July 5, 1974.
Belgian Patents Report, Vol. 5, No. 22, p
1974.

rs: *Patents, *Phenols,
ganisms, Oxidation, *Anaerobic
Nitrogen, Biodegradation, *Waste
atment, Industrial wastes, Temperature,
wastes.

l for removing phenols from water has
nted. Phenols are removed anaerobically
roorganisms which decompose phenols
esence of nitrates and/or nitrites. The
nisms utilized may be obtained from
rom the mud of oxidation pools around
using or making phenol. Nitrate and/or
re added to the water to maintain a
content between 0 and 10 g/liter. The
nat can be removed by this process in-
nol itself, o- m- or p-cresol, naphthols,
ydroxy phenols such as catechol and
enzoates and 3,4-dihydroxybenzoate.
dation can occur between the limits of
nd a pH of 6.5-10.0. The optimal condi-
0-35 C and pH 7.5.-8.5. (Orr-FIRL)
4

UNOFF DISPOSAL OF WASTE STA-
ON POND EFFLUENT,
linistry of the Environment, Toronto.
ience Section.

ntario Agreement on the Great Lakes
lity, Research Report No 22, Training
ology Transfer Division (Water), En-
l Protection Service, Environment
ttawa, Canada, July 1975. 24 p, 3 fig, 6
append. 71-1-19.

Descriptors: *Sewage effluent, Ponds, Municipal wastes, Nutrient removal, Runoff, Effluents, Irrigation, *Waste water disposal, *Waste water treatment, *Canada.
Identifiers: *Spray runoff disposal, Smithville, Ontario, Irrigation - infiltration process, Effluent land disposal, Effluent quality.

Effluent from the Smithville municipal waste stabilization pond has been sprayed on a sloping (5 percent) area of soil with a permeability K less than or equal to 0.14 in/hr (1/10,000 cm/sec) for two seasons. Results indicate that a combined pond and spray runoff system can reduce the phosphorus loading on a receiving stream by 90 percent and the hydraulic input by 50 percent. Spray runoff disposal of sewage effluent appears to be a feasible means of upgrading effluent quality provided erosion and/or damage to vegetation does not occur. (Environment Canada)
W76-04161

EVALUATION OF THE BARBER - COLMAN WETOX PROCESS FOR SEWAGE SLUDGE DISPOSAL,
Ontario Research Foundation, Toronto. Dept. of Environmental Chemistry.
D. Seto, and D. K. Smith.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No 20, Project No 73-5-6, Environment Canada, Ottawa Canada, Environmental Protection Service, Training and Technology Transfer Division (Water), May 1975. 75 p, 15 fig, 14 tab, 23 ref, 3 append. 73-5-6.

Descriptors: Sludge, Disposal, *Waste water treatment, Costs, Equipment, Research and development, Technology, Solid wastes, Dewatering, Effluents, Organic wastes, Temperature, Pressure, Activated sludge, Alkalinity, Filtration, *Sewage sludge, Chemical oxygen demand, Slurries, *Canada, *Sludge disposal.
Identifiers: Pyrolysis, Sterilization, Recovery, Deoderizing, *Wet air oxidation, Solids reduction, Retension time, *Barber-Colman Wetox process.

An investigation was carried out to evaluate the suitability of the Barber - Colman Wetox process for municipal sewage sludge disposal. Technical and economic data for the Wetox process were gathered through literature, special correspondence, pilot plant visits as well as some experimental and analytical work performed at the Ontario Research Foundation (ORF) laboratory. These Wetox data were then analysed and compared with those of other sludge disposal methods. Particular emphasis was placed on the comparison between the Wetox process and the Zimpro process since they are rather similar in operation. Based on the evaluation of a limited amount of laboratory and pilot plant data, it appears that the Wetox process is simple to operate at 450 F, 600 psi (approximately 232 C, 4137 kPa) with 0.3 per cent sulphuric acid. The process is suitable for sewage disposal, although no commercial scale Wetox plant has yet been built. Furthermore, Wetox can achieve similar sludge destruction efficiency, i.e. approximately 80 per cent destruction of suspended solids and 65-82 per cent reduction in COD, but at a lower temperature and pressure than the corresponding Zimpro process. This is believed to be due to the design of the Wetox reactor, which ensures adequate oxygen transfer into the sludge, as well as the addition of a small amount of sulphuric acid to speed up the oxidation. (Environment Canada)
W76-04164

WASTEWATER TECHNOLOGY CENTRE, CANADA CENTRE FOR INLAND WATERS, BURLINGTON, ONTARIO, ANNUAL REPORT 1974.
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W76-04173

SEMINAR ON FISH PROCESSING PLANT EFFLUENT TREATMENT AND GUIDELINES, 1974.
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W76-04174

HIGH PERFORMANCE PLASTIC BACTERIAL BEDS. EXPERIMENT WITH THE TREATMENT OF INDUSTRIAL AND URBAN WASTES WATERS (LES LITS BACTERIENS PLASTIQUES A HAUTE PERFORMANCE. PRESENTATION DE L'EXPERIENCE ACQUISE DANS LE TRAITEMENT DES EFFLUENTS INDUSTRIELS ET URBAINS),
C. Camilleri, and B. Vigreux.
Techniques et Sciences Municipales, Vol 68, No 11, p 483-490, November, 1973, 7 fig.

Descriptors: *Filters, *Bacteria, *Waste water treatment, *Industrial wastes, *Biological treatment, *Municipal wastes, Equipment, Plastics, Food processing industry.
Identifiers: *Flocor, Bacterial filter beds, Municipal-industrial wastes.

High-performance plastic bacterial beds, in the form of percolation bodies, and their uses in the treatment of industrial and municipal waste waters are described. Type E plastic bacterial beds (Flocor) are designed as modules of 600 x 600 x 1,200 mm. The purificiation efficiency of one stage varies from 50 to 75%. The module has a specific surface of 90 sq m/cu m due to its being composed of plane and undulated plastic sheets. The waste water to be treated percolates from the top downward, and air circulates upward. The bacterial mass can reach up to 300 kg/cu m. The rate of percolation lies at 1.5 cu m/h per sq m. Percolation towers with plastic bacterial bed modules are currently used for the treatment of waste waters with BOD5 loads such as those generated by the starch industry and dairies, and for the treatment of urban effluents. High-performance plastic bacterial beds can be used for the enlargement of existing biological treatment plants, as a first stage before conventional biological treatment plants for industrial waste waters, and for the treatment of industrial waste waters prior to discharge into the communal sewer system. (Erdelyi-FIRL)
W76-04182

INVESTIGATION OF PHOSPHORUS REMOVAL FROM WATER,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen, O. Libor, and K. Barkacs.
Water Research, Vol 7, No 12, p 1885-1897, 1973. 4 fig, 7 tab, 8 ref.

Descriptors: *Nutrient removal, Phosphorus, Waste water treatment, *Chemical precipitation, Suspended solids, Polyelectrolytes, Water treatment, Turbidity, Flocculation, Calcium hydroxide.
Identifiers: *Phosphorus removal, Aluminum sulfate.

The removal of different phosphate compounds from water and waste water by a precipitant was investigated. In water treatment, calcium hydroxide precipitated orthophosphate with greater efficiency than aluminum sulphate; aluminum sulfate gave better efficiency in the removal of polyphosphates. Calcium hydroxide was not able to precipitate the phosphate in glucose phosphate, and aluminum sulfate effected only a slight precipitation. Bentonite and polyelectrolyte (partly anionic type), in conjunction with aluminum sulfate, gave an increased phosphate reduction, a decreased turbidity of the liquid and a decreased sludge volume. In treatment waste water, considerably better results were achieved, due to the high content of suspended matter, which helped to bind the phosphate compounds into flocs. The use of bentonite and polyelectrolyte in treating waste water gave better results,

as did calcium hydroxide used alone for precipitation. (MurphyyFIRL)
W76-04183

PREPARATION OF SURFACES FOR GALVANIZATION. TREATMENT OF THE EFFLUENTS (PREPARATION DE SURFACES AVANT GALVANISATION. TRAITEMENT DES EFFLUENTS),
L. Antoine.
Galvano-Organo, Vol 42, No 438, p 1093-1094, November, 1973.

Descriptors: *Industrial wastes, *Recycling, *Metals, *Waste water treatment, Alkalinity, Reverse osmosis, Water reuse, Lime, Iron compounds, Filtration.
Identifiers: *Galvanization.

Two different solutions for the partial recycling of waste waters from the pickling and rinsing of metallic workpieces prior to galvanization are described. These waste waters contain hydrochloric acid, and iron chloride. According to one solution, the effluents are neutralized with lime, and then oxidized for the conversion of free acid and iron chloride into calcium chloride and ferric hydroxide, the latter of which is eliminated in a static decanter. The solution obtained contains all chlorine ions in the form of calcium chloride in solution. This solution is treated continuously with sulfuric acid for the conversion of calcium chloride into hydrochloric acid and calcium sulfate, the latter being continuously removed by filtration or decanting. The residual calcium sulfate is not higher than two mg/liter. Another solution to the recycling problem, permitting different uses of the recycled water, is the separation of the total effluent into a clear fraction suitable for direct recycling, and another residual fraction by reverse osmosis. The residue is neutralized with lime, oxidized, decanted for the removal of iron hydroxide, treated with sulfuric acid for the regeneration of hydrochloric acid, and filtered for the removal of calcium sulfate. (Erdelyi-FIRL)
W76-04184

COUNTERCURRENT FLOW OSMOTIC PROCESSES FOR THE PRODUCTION OF SOLUTIONS HAVING A HIGH OSMOTIC PRESSURE,
University of the Negev, Beersheba (Israel). Research and Development Authority.
For primary bibliographic entry see Field 3A.
W76-04185

A CENTRIFUGAL METHOD FOR THE EVALUATION OF POLYMER MEMBRANES FOR REVERSE OSMOSIS,
National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center.
J. R. Hollahan, T. Wydeven, and R. P. McCullough.
Journal of Applied Chemistry and Biotechnology, Vol 23, No 9, p 669-674, 1973. 4 fig, 1 tab, 4 ref.

Descriptors: *Polymers, *Reverse osmosis, *Membranes, *Water treatment, *Laboratory tests, *Centrifugation, Screens, *Waste water treatment, Treatment facilities.
Identifiers: Space wastes.

A laboratory centrifuge method may prove to be useful for the evaluation of membrane performance during the reverse osmosis process. Results are given for cellulose acetate membranes for rejection of salt and urea dissolved solids. Implications of the study included rapid screening of membrane performance, use in laboratories with limited facilities, and possible space waste water purification. (Murphy-FIRL)
W76-04186

DISPOSAL OF LIQUID WASTE BY POWELL DUFFRYN PROCESS.
Chemistry and Industry, No 1, p 3, January, 1974.

Descriptors: *Chemical industry, *Industrial wastes, *Oil wastes, Chemical wastes, *Waste water treatment, Lagoons, Textiles, Mining, Storage tanks, Liquid wastes, Waste disposal.
Identifiers: *Chemfix process.

The 'Chemfix' process is described in which industrial liquid waste is pumped into a plant housed in a 40 ft mobile road trailer. The plant treats the waste with chemical reagents and then discharges it to form a manageable, solid material suitable for landfilling. The process was invented by Environmental Sciences Incorporated, Pittsburgh, Pennsylvania. The 'Chemfix' mobile plant can operate on sites wherever waste quantities in lagoons or storage tanks exceed 50,000 gallons. The process is applicable to wastes such as those produced by the chemical oil and petroleum, mining, textiles and metal production and treatment industries. (Murphy-FIRL)
W76-04188

SORBENT FOR REMOVAL OF HEAVY METALS,
Mobile Oil Corp., N.Y. (Assignee).
D. D. Whitehurst, S. A. Butter, and P. G. Rodenwald.
United States Patent 3,793,185, Issued February 19, 1974. Official Gazette of the United States Patent Office, Vol 919, No 3, p 963, February, 1974. 1 fig.

Descriptors: *Heavy metals, *Waste water treatment, *Patents, *Liquid wastes, Sorption, Oil wastes, Recycling.
Identifiers: *Sorbents.

A patent for using sorbents in a process of selective removal of heavy metals from liquid streams has been granted. These sorbents selectively remove alkyl lead moieties from gasoline. The sorbents are comprised of metal halides (preferably tin tetrachloride or antimony pentachloride) bonded to a suitable substrate through at least one amine or alkyl halide functional group. The sorbents can be effectively regenerated. (Murphy-FIRL)
W76-04189

SYSTEM OPTIMIZATION FOR PULP AND PAPER INDUSTRIAL WASTEWATER TREATMENT DESIGN,
Texas A and M Univ., College Station. Dept. of Industrial Engineering.
C. S. Shih, and P. Krishnan.
Water Research, Vol 7, No 12, p 1805-1820, 1975. 8 fig, 11 tab, 13 ref.

Descriptors: *Pulp and paper industry, *Industrial wastes, *Waste water treatment, *Design, Economics, Costs, Analytical techniques, Planning, Systems analysis, *Optimization.

System optimization of industrial waste treatment design is a decision inversion method which integrates dynamic programming techniques into existing process design principles. The optimum combination of various unit processes in a multistage plant are identified so as to derive the most economic decisions and meet the ultimate design criteria. A numerical example for typical paper and pulp industrial waste treatment design is presented. Many practical cost functions have also been developed for the analysis of the pulp and paper industrial waste water treatment system which consists of different process alternatives. (Murphy-FIRL)
W76-04190

BLAIR'S TRAINED BUGS EAT PVA WASTE.
Textile World, Vol 124, No 2, p 43-44, February, 1974.

Descriptors: *Activated sludge, *Waste t
treatment, Biochemical oxygen demand, Che
oxygen demand, *Textiles, Biodegrada
Microorganisms, Biological treatment, S
Carolina.
Identifiers: *Polyvinyl alcohol(PVA).

Blair Mills, Belton, South Carolina, has had
polyvinyl alcohol for warp sizing in its we
operations. Polyvinyl alcohol is generally th
not to be susceptible to biodegradation, but
Mills initiated an activated sludge waste trea
system that features trained microorganism
digest PVA and give the plant high reducti
both BOD and COD -- 95 to 98% BOD reduct
all weather conditions, and 95% COD red
with a near neutral pH. Blair uses a Du Pon
product, introducing it to the sludge system
over time, and allowing the sludge microorga
to acclimate to the diet change. Eventuall
become 'educated' and biodegrade the pr
Blair feeds the activated sludge mixtures co
ing decreasing amounts of usual mill effluen
increasing amounts of PVA for 30 to 40 day
system consists of a series of screens, an eq
tion tank, and an agitator which blends the
rich wastes. Two aeration ponds contain
fluent for five days, after which the water
through a clarifier or separator. Solids fr
bottom are recylced, and clear water at to
over into the stream. With a 0.5 percen
addon at the slasher, 100 percent cottom pi
protection equivalent to 3 percent starch a
provided. (Murphy-FIRL)
W76-04191

**INVESTIGATIONS ON THE BIOLO
DIGESTION OF EVAPORATION CO
SATES GENERATED IN SULFITE
PRODUCTION (UNTERSUCHUNGEN
DIE MOEGLICHKEIT DER BIOCHEMI
REINIGUNG DES BEI DER SULFIT
STOFFHERSTELLUNG ANFALLENDE
DAMPFKONDENSATES),**
H-J. Walther, and D. Knaack.
Fortschritte der Wasserchemie, No 15, p 2
1973. 1 fig, 2 tab, 26 ref.

Descriptors: *Waste water treatment, *In
wastes, Pulp and paper industry, *A
sludge, Biological treatment, *Biodegr
*Pulp wastes, Evaporation, Biological trea
Identifiers: Evaporation condensates.

A report is presented on investigations co
activated sludge treatment of the evaporat
densate which is a by-product of thesul
production. The model evaporation co
used for the experiments contained ace
formic acid, furfural and sulfur dioxi
evaporation condensate has been show
amenable to biochemical digestion after di
the presence of a nitrogen and phosphoru
however, the morphology of the biologica
was changed considerably and no longer
conventional conception of an activate
process. Furfural, which should be regard
cially hazardous as to its effects on the
water, was completely eliminated by the b
cal treatment of the evaporation co
(Murphy-FIRL)
W76-04192

**STEAM STRIPPING REMOVES BOI
POUNDS FROM CONDENSATES OF C
OUS PULP MILL,**
Resenlew (Oy. W.) A.B., Pori (Finland).
A. A. R. Roennholm.
Pulp and Paper International, Vol 16, N
49, February, 1974. 4 fig, 1 tab, 9 ref.

Descriptors: *Waste water treatment, *
wastes, Pulp and paper industry, *Bioche
ygen demand, Methanol, Costs, Recycli
reuse, *Pulp wastes.
Identifiers: Zero discharge, Steam stripp
pulping wastes, Turpentine.

ery of turpentine and methanol from the
isates of a continuous kraft pulping line is
d by a steam stripping system developed at
senlew AB's kraft pulp mill in Finland. In-
g the turpentine yield becomes a vital cost
along with optimization of steam consump-
ing steam stripping treatment of evaporator
isates to reduce the BOD load. When fish-
d evaporating the black liquor after the
r, methanol and turpentine are released, in
n to sulfur compounds. Most of the
ol is found in the condensates from the
ator after the feed unit, and in the seconda-
h vapor. Turpentine yield can be improved
anting with lengthened flow-through time,
ing a line of decanters, and adding surface-
chemicals. However, methanol content
e decreased to effect the best possible mix-
methanol, turpentine, and water for effi-
ecanting. Reducing kraft mill effluent while
ing the turpentine and methanol yield
to be economically feasible by the steam
g method, particularly in mills where the
contains large quantities of these sub-
. Reuse of the condensate permits closing
em. (Murphy-FIRL)
194

ICAL RECOVERY PLANT IS FINAL
OF $9.2 MILLION WASTE PROGRAM,
y.
an Pulp and Paper, Vol 27, No 3, p 18-19,
1974, 5 fig.

tors: *Waste water treatment, *Industrial
Pulp and paper industry, Ion exchange,
wastes, Lignins, Pollution abatement,
liquors, *Treatment facilities, Canada,
al wastes.
ers: *Chemical recovery systems.

tario Paper Company Limited, Thorold,
, has found its new chemical recovery
feasible and encouraging. It is the largest
ant in the world, and is the last stage of a
age pollution abatement program begun by
pany in 1969. The first two stages included
ion of a clarifier and construction of an ion
e plant. The chemical recovery plant com-
quid wastes from the by-product and
l pulping operations in weak liquor storage
hen concentrates them in five stainless
aporator bodies. Liquor is drawn off to
rated liquor tanks to be stored for burning.
tem also consists of a fluid-bed reactor,
clone to trap large particles. Waste treated
hemical recovery plant is unique--an ox-
gnin with a very high inorganic content
of the plant's vanillin operation. Vanillin
l alcohol are by-products of the facility's
ulfite liquor. Problems in the treatment
were scaling in the evaporators, dust
on system plugging, and foaming in the
. The company's environmental director
stic about working out these problems and
mproving the process. Plans for recovery
sequent sale of lignin from waste liquors
made. (Murphy-FIRL)
95

ORK FIRM BUYS CHEMICAL WASTES
CYCLING.
l Wastes, Vol 19, No 6, p 14-15, 27,
er/December, 1973.

ors: *Waste water treatment, *Industrial
*Chemical wastes, *Byproducts,
ng, Waste disposal, Waste storage, Waste
t.

ol Pollution Services, Incorporated, in
ity, New York, buys or takes at no cost
stes from chemical and electronic com-
manufacturers, metal plater and photo
and converts them to saleable organic
ganic chemicals, solvents, metals and

salts. Greater than 50% of the processed wastes are reclaimed, with a higher percentage of reclamation expected in the future. Storage capacity in the plant has been increased in order to inventory these large amounts of liquids prior to processing, with tanks and holding ponds are receptacles. Pond linings are made of a chlorinated polyethylene material. Chem-Trol is unique in that it can handle waste chemicals without generating waste itself; wastes from one process provide raw materials for another. The plant has not outfalls, and emits only carbon dioxide, water vapor, and saleable goods. Although most of its customers and suppliers are from neighboring areas, toxic wastes from as far away as Colorado are processed. The following processes are utilized by the company: filtration, thermal oxidation, pH adjustment to neutrality, distrillation, chemical fixation, physical separation, and scientific landfill. Chem-Trol is planning to set up more waste processing centers in other parts of the country and abroad. (Murphy-FIRL)
W76-04196

METHOD OF PURIFYING WASTE FLUID,
United States Steel Corp., Pittsburgh, Pa. (Assignee)
W. J. Didycz, and D. Glassman.
United States Patent 3,790,448, Issued February 5, 1974. Official Gazette of the United States Patent Office, Vol 919, No 1, p 273, February, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Patents, Heat treatment, Waste water disposal, Liquid wastes.

A method of purifying waste fluid containing waste water and corrosive salts with high temperature steam to obtain a salt-free condensate is described. The waste fluid and steam were produced in a coke-producing apparatus and are normally utilized to quench coke in a coke-quenching apparatus. The waste fluid is heated in a heat exchange relationship with the steam to a predetermined temperature at a given pressure. The high temperature steam is condensed to form essentially salt-free condensate. The heated waste fluid is vaporized at the predetermined temperature and pressure to vaporize a portion of the waste fluid and to concentrate the corrosive salts to form a concentrate. The pressure is lower than the pressure of the waste steam from the coke-quenching apparatus. The heated-vaporized portion of the waste fluid is condensed to form a salt free condensate. The condensate can be used in an industrial application which eliminates the disposal of the waste fluid. (Murphy-FIRL)
W76-04197

REMOVING FINE PLASTIC PARTICLES FROM WASTE WATER.
French Patent FR 2182128, Issued December 7, 1973. French Patents Abstracts, Vol U, No 5, p D7, March 7, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Chemical wastes, Flotation, Surfactants, *Plastics.
Identifiers: *Polyvinyl chloride(PVC) particles.

A process for removing fine plastic particles from waste water by flotation after foaming with surfactant and a stream of gas bubbles has been patented. Fine particles of plastic material, especially polyvinyl chloride (PVC), are removed from the waste water by adding a surface active agent, which can produce a foam, to the waste water; subjecting the waste water to the action of a stream of fine gas bubbles; and, removing the foam which has accumulated at the surface of the bath by raking. This foam contains a high concentration of plastic particles. The foam is dehydrated in a centrifuge, or by a drum filter coated with a filter aid. Almost complete elimination of the fine plastic particles from the waste water is achieved using a relatively small amount of surface active agent. (Murphy-FIRL)
W76-04198

CONTINUOUS TREATMENT OF WASTE WATER CONTAINING PHENOL BY CANDIDA TROPICALIS (CANDIDA TROPICALIS NI YORU FERNORU GANYU HAISUI NO ZEN-ROKU SHORI),
Osaka Univ. (Japan). Faculty of Engineering; and Osaka Univ. (Japan). Dept. of Fermentation Technology.
T. Shimizu, T. Uno, Y. Dan, N. Nei, and K. Ichikawa.
Hakko Kogaku Zasshi, (Journal of Fermentation Technology), Vol 15, No 11, p 809-812, November 1973. 7 fig, 2 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Phenols, *Biological treatment, Microorganisms, Biodegradation.
Identifiers: *Candida tropicalis.

The kinetics of continuous treatment of waste water containing phenol by Candida tropicalis No. 708 were investigated. A maximum dilution rate of 0.25/hr for treating an inlet concentration of 2,500 ppm of phenol produced an outlet concentration below one ppm. A 'wash out' of organisms occurred at a lower dilution rate when a higher inlet concentration of phenol was used. The maximum dilution rate at which 'wash out' occurred was 0.1/hr for an inlet phenol concentration of 5,000 ppm. This was caused by the inhibitory effect of the increasing concentration of phenol in the reactor, originating from an increase in the amplitude of the cyclic fluctuation of the concentration of phenol and the cell mass in the reactor with an increase of outlet phenol concentration. Both the saturation constant and the inhibition constant, for phenol-metabolism by C. tropicalis No. 708 were very low in a continuous system. The affinity of phenol as a substrate and inhibitor for C. tropicalis No. 708 was very high. Therefore, it was possible that a low outlet concentration of phenol was obtained, even if the dilution rate around the maximum value was adopted. However, the system tended to become unstable due to the inhibitory effect. (Murphy-FIRL)
W76-04199

WASTE EXTRACTION PROCESS,
Chlortrol, Inc., Russellville, Ark. (Assignee)
J. W. Gooch.
United States Patent 3,803,290, Issued April 9, 1974. Official Gazette of the United State Patent Office, Vol 920, No 2, p 744, April, 1974. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Food processing industry, Pulp and paper industry, Odor, Coagulation, Inorganic compounds, Organic compounds, *Oxidation, Separation techniques.

A waste oxidation and waste extraction process for deodorizing, coalescing, agglomerating, coagulating, and extracting organic and inorganic waste materials found in the waste streams of packing and rendering plants, paper and pulp mills, food processing plants, wood preserving plants, rice processing plants, and similar facilities was patented. The process comprises the introduction into the waste stream of an activated gas which is adsorbed on the surfaces of the suspended organic and inorganic particulate and molecular waste materials to react with the surface of the waste materials. This produces surface characteristics which eliminate molodorous properties and induce agglomeration and coagulation of the solids. (Murphy-FIRL)
W76-04200

95% BOD REMOVAL RESULT OF FRUIT PLANT MODIFICATIONS,
Chester Engineers, Inc., Corpolis, Pa.
A. F. Lisanti, and S. Balakrishnan.
Water and Waste Engineering, Vol 11, No 3, p B1-B2, B4, B6, March, 1974. 11 fig, 5 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Lagoons, Aeration, Aerobic conditions, *Biochemical oxygen demand, Suspended solids, Aerated lagoons, Fruit crops, New York.

Comstock Foods, a division of Borden, Incorporated, has built a new plant at a cost of $300,000 at Red Creek, New York, on a 50-acre site. Processing and packing of apple and cherry crops constitute the bulk of the total plant production, and wastes derive from washing, peeling, pitting, slicing and clean up operations. The old waste treatment facilities consisted of four conventional anaerobic lagoons in series. They were reshaped and modified to form part of the new system in the following ways: lagoon I was reduced in size to provide about one day's detention and to serve as the raw waste equalization lagoon; lagoon II had its sides and bottom resloped to provide a liquid depth of ten feet and rip rap at the water line, and to service as the aerated lagoon; lagoons III and IV were deepened and reshaped to allow for retention of the treated effluent during dry weather. In addition to these modifications an intercept drainage trench was provided around the lagoons to prevent any runoff from adjacent fields from draining into Red Creek. The old waste water collection, pumping and screening systems were completely rebuilt to handle the flow and more effectively remove solids. Whenever a discharge from lagoon IV is made, eight-hour composite samples are taken and analyzed for BOD5 and suspended solids. Average BOD5 removals across the aerated lagoon and the entire treatment system are 83% and 96%, respectively. (Murphy-FIRL)
W76-04201

ISIS WATER TREATMENT.
The Steam and Heating Engineer, Vol 43, No 506, p 16-17, January, 1974. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, Automatic control, Automation, Water treatment, Water reuse, *Recycling, Treatment facilities.
Identifiers: *Metal finishing wastes, Zero discharge.

The Isis system of waste water treatment was introduced in 1972 by the H. D. Jackson Company, Limited, as a fully automatic method for the metal finishing and allied industries. The company has expanded its scope and the Isis systems can now be modified for handling demineralization, base exchange, softening, and waste water purification. The Isis system consists of individual modules which allow for a high degree of flexibility. The modular units are: pressure vessels; powered valve capsule; sequence controller; and, pH controller and recorder. The Isis modular system is used for boiler water treatment at the Willenhall Works of Albert Marston and Company Limited, a manufacturer of aluminum products anodised at their own plant. The anodising process uses sulfuric acid electrolytes or chromic acid to give an opaque finish, with dyes added. For most applications the coating must be sealed, and this is most effectively carried out in pure boiling water. The installation, although complete in itself for boiler water treatment, forms the nucleus of a plant which is to be extended to handle future demand for treatment of final rinse water, sealing water, and vat make-up for anodising plant, and ultimately provide recirculation and reuse of effluent. The rising cost of water and the stringent control of effluents for disposal to the sewers will enhance the value of a plant of this type which can simultaneously perform all these functions, not only in metal finishing works but also in other industries. (Murphy-FIRL)
W76-04202

WASTE WATER RECYCLING PROCESS,
D. W. Brackett.
IBM Technical Disclosure Bulletin, Vol 16, No 9, p 3056-3057, February, 1974. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Water reuse, *Recycling, Metals, Neutralization, Hydrogen ion concentration, Filtration, Reverse osmosis, Electrodialysis, Evaporation, Centrifugation, Treatment facilities.
Identifiers: *Metal finishing wastes, Zero discharge, Freeze crystallization.

Waste water from metal plating and metal etching operations is treated for recovery of useful solid contents, while permitting recycling of the water through the plant without creating the sludge deposits that result from ordinary waste water treatment methods. The method does not require the addition of sludge-forming chemicals to the waste water; saves the cost of valuable material reclaimed from the waste waters; and, does not require large, expensive evaporator or freezer units. Separation of solids from the water is accomplished in a gradual, progressive fashion with reentrant feedbacks at several points, thereby minimizing the loads on the individual purifying units. The process consists of equalization tanks, pH adjustment facilities, filters, reverse osmosis or electrodialysis units, organic material removal unit, evaporator, freeze crystallizer unit, and centrifuge. (Murphy-FIRL)
W76-04203

MANGANESE REMOVAL BY TWO-STATE FILTRATION (ENTMANGANUNG DURCH ZWEISTUFFENFILTRATION),
K. Rudolf.
Fortschritte der Wasserchemie, No 15, p 125-136, 1973. 6 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Filtration, Iron, *Manganese.
Identifiers: Demanganization.

Large amounts of iron and manganese present together in raw water will cause problems with removing the manganese through a filter bed. Due to its lower oxidation capacity, iron is converted more quickly to an insoluble form. It covers the filter sand grains and clogs the catalytic surfaces necessary for demanganization. These difficulties can be overcome by two-stage filtration; iron removal is accomplished in the first stage and manganese removal in the second. Discussion is presented on how the demanganization state was artificially prepared for operating at full capacity, on investigations concerning the hydraulic pollution load capacity, and on the state of the qualitative clear water parameters, connected with it. Operational results showed that at full capacity of the demanganization state of up to 250 cu m/hour per rapid filter a manganese-free filtrate can be obtained. (Murphy-FIRL)
W76-04204

DEEP-TANK EXTENDED AERATION OF REFINERY WASTES,
Atlantic Richfield Company, Harvey, Ill.
W. L. Rose, and R. E. Gorringe.
Journal Water Pollution Control Federation, Vol 46, No 2, p 393-403, February, 1974. 9 fig, 6 tab, 2 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, Separation techniques, Pilot plants, Activated sludge, Aerated lagoons, Biological treatment, Surface runoff, *Oil wastes, *Aeration, Indiana.
Identifiers: Refinery wastes.

The Atlantic Richfield Company's refinery in East Chicago, Indiana, manufactures a wide range of products by employing these processes: atmospheric and vacuum distillation, fluid catalytic cracking, catalytic reforming, alkylation, polymerization, propane deasphalting, distillate desulfurization, solvent dewaxing, solvent treating, chemical treating, and hydrotreating. Combined refinery waste water and surface runoff water averaging five mgd is first treated in API-type gravity oil separators that remove a large tion of free oils and coarse solids. The sepa effluent is pumped to the extended aeratio tivated sludge plant where it undergoes biolo oxidation in the specially developed deep- aeration system. In order to determine the bility of using biological treatment for the ref effluent two separate pilot plant studies wer dertaken. The studies involved the use of a tinuous bench-scale biological unit and a tended aeration basin with no sludge recircul The complete mix activated sludge process ing a deep-tank configuration has been de strated to be a practical method for the trea of refinery waste waters. The system has the ty to treat effluent with varying organic loa and oxygen demands that are inherent in refinery operation. (Murphy-FIRL)
W76-04205

POSSIBILITIES AND LIMITATIONS IN COMBINED PURIFICATION OF DOME AND INDUSTRIAL WASTE WA (MOEGLICHKEITEN UND GRENZEN GEMEINSAMEN REINGUNG HAEUSLI UND GEWERBLICHER ABWAESSER),
K. R. Imhoff.
VDI-Berichte, No 207, p 93-101, 1973. 9 fig, 7 ref.

Descriptors: *Industrial wastes, *Mu wastes, *Waste water treatment, Pre ment(Water), Biological treatments, Ana conditions.
Identifiers: *Municipal-industrial *Combined treatment.

Possibilities and limitations of the combine ment of domestic and industrial waste wat discussed. Joint treatment is economical w specific costs of treatment sharply reduce creasing throughput capacities, especially 100,000 population equivalents. The co treatment creates no particular problems p that the industrial waste waters are non-to their share does not exceed 30% of th volume to be treated. Most industrial waste require mechanical-chemical pre-treatmen as precipitation and neutralization) prior discharge into the municipal sewer syste addition of industrial waste water is also e for establishing the correct nutrient balanc waste water for efficient biological purif Waste waters that are too concentrated sh treated anaerobically rather than by the method due to the limited capacity of th Special waste waters may require tw biological purification with separate systems and different kinds of bacteria. E demonstrating the combined purificati domestic and pre-treated industrial waste are presented. (Erdelyi-FIRL)
W76-04207

METHOD FOR TREATING WASTE LIQ
M. Ohta.
United States Patent 3,806,435, Issued 1974. Official Gazette of the United State Office, Vol 921, No 4, p 1600, April, 1974.

Descriptors: *Patents, *Waste water tr *Liquid wastes, Electrolysis, Sulfides, Ir Aluminum, Hydrogen sulfide, *Industrial Sulfite liquors.

A patent was issued for a method for waste liquor. It consists of subjecting liquor containing one or more sulfidic nants (hydrogen sulfide, alkaline sulfides ganic or organic hydrosulfides) to ele treatment. An anode of iron alumi zinc/aluminum and a cathode of iron or used. Thus, the sulfidic contamina eliminated from the waste liquor. (Murphy W76-04209

DIATOMITE FILTER SOLVES COOLING WASH WATER PROBLEMS FOR STIC MOLDING OPERATION,
c Mold Co., Rocky Hill, Conn.
Gerber.
tion Engineering, Vol 5, No 2, p 17, 20, h/April, 1974, 1 fig.

iptors: *Filters, *Diatomaceous earth, er reuse, *Plastics, Economics, Cooling , *Waste water treatment, Algal control, ria, *Filtration.

field of plastic injection molding, the quality ling water is vital. Pollution may occur due rticles carried in city water supplies or ed from rusting or paint-chipping from steel e tanks. There may also be algae growth, g to clogging and overheating. The Prototype astic Mold Company in Rocky Hill, Connec- encountered both these problems. A viable n was a new diatomaceous earth filter, produced clear water. This operated using a g towere with a storage sump to recirculate ter. The modular industrial filter takes only inutes to complete the backwashing and new ating cycle. Microscopic particulate matter, ng algae and many bacteria were removed. ew industrial filter has been tried for one ith no breakdowns and readily apparent nic advantages. (Murphy-FIRL)
4210

OD FOR PURIFYING THE LIQUOR OF A ANIZING PROCESS PLANT AFTER AMINATION,
Eddleman.
States Patent 3,801,481, Issued April 2, Official Gazette of the United States Patent Vol 921, No 1, p 300, April, 1974.

tors: *Patents, *Metals, Water reuse, ng, Anodes, Cathodes, Electrolysis, Filtra- ron oxides, *Industrial wastes, *Waste eatment.
ers: Galvanizing, *Metal pickle liquors.

t has been granted for a method of purify- lvanizing and/or metal cleaning plant pickle o permit reuse. The operation includes the f placing a cathode and an anode in the nd passing a DC current through the liquid. iron and other metal molecules are ed by means of a magnet in the near vicini- e cathode. Iron oxides and other metallic formed near the anode. These are insolu- e liquor, and can subsequently be removed tion. (Murphy-FIRL)
211

NUOUS ION EXCHANGE IN FLUIDIZED

d University, Yorks, United Kingdom, of Chemical Engineering.
ter.
adian Journal of Chemical Engineering, No 1, p 43-51, February, 1974. 15 fig, 5 tab,

ors: *Ion exchange, *Mathematical *Pilot plants, Mixing, Water treatment, al wastes, Metals, Model studies, *Waste atment.
rs: Ion exchange columns, *Fluidized

lant was built to test the mathematical eveloped for the prediction of the per- of a continuous ion-exchange column. e of equipment is used industraially for atment and metals recovery on a large e model comprises a series of fluidized sin, operated with periodic flows of both Experimental work was carried out on extraction from clarified liquors and un- re leach pulps. Hydrodynamic studies on resin and pulp in fluidized beds were made and a simplified calculation procedure was done for mass transfer performance. The work confirmed the observations of other researchers that a series of fluidized beds can give high degrees of extraction in a short column. An assumption here of perfect mixing makes the data used specific to this apparatus. Such a mathematical model allows the investigation of possible optimum operating conditions, and an understanding of the inter-relationships between the variables. (Murphy-FIRL)
W76-04212

THE TAILINGS POND AS A WASTE TREATMENT SYSTEMS,
Montreal Engineering Company Limited, Fredericton, New Brunswick, Canada, Water Resources and Environmental Division.
A. V. Bell.
The Canadian Mining and Metallurgical Bulletin, Vol 67, No 744, p 73-78, April, 1974. 3 fig, 2 tab, 6 ref.

Descriptors: *Mining, *Waste treatment, *Metals, Industrial wastes, Solids removal, *Waste water treatment, Waste disposal, Planning.
Identifiers: *Tailings pond.

A tailings pond is the most common form of waste treatment system used by the base metal mining industry. Waste streams are discharged into this impoundment. Solid wastes are settled for perpetual storage behind a dam and the ponded area formed above these is used to treat the aqueous decant. Although the system is simple and familiar to the industry, several engineering and waste management considerations must be applied to their design and operation. This paper presents some of the considerations to be included in the planning, design, and operation of tailings systems. (Murphy-FIRL)
W76-04213

SORPTION OF TRACE QUANTITIES OF METAL IONS BY BENTONITE CLAY FROM A THIOSALT MEDIUM,
Department of Energy, Mines, and Resources, Ottawa, Ontario, Canada, Mineral Sciences Division, Mines Branch.
H. F. Steger.
Canadian Mining and Metallurgical Bulletin, Vol 67, No 744, p 90-95, April, 1974. 6 fig, 2 tab, 9 ref.

Descriptors: Mining, *Metals, *Industrial wastes, *Waste water treatment, Lime, Iron, Copper, Zinc, Manganese, Hydrogen ion concentration, Sodium, Calcium, Ions, *Srption, Clays.
Identifiers: *Bentonite clay.

Trace amounts of iron, copper, zinc and lead, in the presence of at least 100-fold excesses of sodium and calcium may be sorbed by bentonite clay from a synthetic (sulphide) mine waste water. The amounts sorbed depend on the nature of concentration of the metal ion, the number and total concentration of the metal ions present, the pH of the medium, the amount of clay used, and the contact time of the clay with the medium. The bentonite clay was tested with a sample of real 'lime-treated' mine waste water. It was found to appreciably reduce the concentration of iron, copper and zinc, but to have no significant effect on manganese concentrations. (Murphy-FIRL)
W76-04214

THE CLOSE CIRCUIT OF INDUSTRIAL WASTE WATERS (DER GESCHLOSSENE KREISLAUF BEI INDUSTREABWASSERN),
W. Bischofsberger.
VDI-Berichte, No 207, p 83-92, 1973.

Descriptors: *Food processing idustry, *Waste water treatment, *Recycling, Water reuse, Pulp and paper industry, Mining, Steel, Water rates, *Industrial wastes, Wter consumption(Except consumptive use).
Identifiers: *Materials recovery, Zero discharge.

The applications of closed water circuits by waste water treatment and recycling in industrial processes are described. The increases in the water rates and waste water discharge rates, and the reductions in load capacity of the recipients all promote measures for reduced water consumptin. The increased rate of waste water recycling is also associated with the advantage of material recovery. In West Germany, the rate of waste water recycling was about 65%, while only 5% of the industrial plants, mostly the largest ones, possessed closed water circuits. Water circuits may be in the cascade or open system, with the waste water from one tage of the process being suitable for use in a subsequent stage, or in the closed system, with the process waste water being returned to the same process after adequate treatment. Examples demonstrating waste water recycling in the mining, steel, surface-treatment, pulp and paper, coke, and sugar industries are presented. The introduction of waste water circuits has resulted in a substantial reduction in the primary water consumption. (Erdelyi-FIRL)
W76-04215

PROTEIN RECOVERY FROM DAIRY WASTES BY ELECTROFLOTATION,
D. C. Lewin, and C. F. Forster.
Effluent and Water Treatment Journal, Vol 14, No 3, p 142-143, 145, 147-148, March, 1974. 2 fig, 5 tab, 15 ref.

Descriptors: *Food processing industry, *Recycling, Proteins, *Waste water treatment, Costs, Industrial wastes, Dairy industry, *Flotation.
Identifiers: Acid coagulation, *Electroflotation, *Protein recovery, Dairy effluents.

It is economically feasible to remove a proporton of the fat and protein from dairy effluents by acid coagulation and electroflotation. This reduces the organic load applied to the secondary treatment process and produces a potentially saleable by-product. Before this potential can be fully realized, drying techniques together with the acceptability of the protein must be examined. This process is a new concept in dairy effluent treatment. As the demand for proteinaceous animal feed supplies becomes more acute and effluent treatment costs continues to rise, a prcess which combines treatment and product recovery would be attractive. (Murphy-FIRL)
W76-04216

APPLIED RESEARCH FOR RO AND UF,
Lund Univ. (Sweden). Food Engineering Div.
G. Eriksson.
Process Biochemistry, Vol 9, No 2, p 18-19, February/March, 1974. 3 fig, 2 tab.

Descriptors: *Food processing industry, *Laboratory tests, *Membrane processes, *Reverse osmosis, Desalination, *Waste water treatment, Industrial wastes, Separation techniques, Reseach and develoment.
Identifiers: *Ultrafiltration.

On a laboratory scale, pressure-driven membrane processes have been used. New applications of the ability of semi-permeable membranes to separate the molecules of a solution have been tried recently in industry. Two processes which the Swedish Board for Technical Development is testing are ultrafiltration and reverse osmois. The technique is applied to desalination, purification of waste water,electrophoretic paint recovery, and concentration and fractionation of whey and milk Problems are discussed, relating to the Swedish food industry' testing of these membrane processes. These are related to instrumentation, pressure and pressure drop, temperature, liquid flow and conductivity during the process, and resistability for specific pH. So far, this test has

been used for whey, potato starch waste water, blood, raw juice from alfalfa, fish protein solutions, and sugar solutions, in order to investigate the separation process. (Murphy-FIRL)
W76-04217

A SOLUTION FOR THE SOLVENT PROBLEM: ACTIVATED CHARCOAL PLANTS (DIE LOESUNG FUER LOESUNGSMITTEL: AKTIVKOHLEANLAGEN).
Oberflache, Vol 14, No 1, p 18-19, January, 1974. 1 fig.

Descriptors: *Activated carbon, *Adsorptin, Hydrocarbons, Organic compounds *Waste water treatment, Industial wastes, *Solvents.

The possible uses and the functioning of activated carbon adsorbers for solvent vapors generated during surface-treatment and degreasing operations are described. The vent air containing solvent vapors is blown through an activated carbon layer for the removal of the solvent until saturation is reached, after which desorption is done with steam. The resulting mixture of steam and solvent is cooled and liquified for the gravimetic separation of water and solvent which later is recovered. Water-sluble solvents are separated from water by distillaion. Such activated carbon adsorbers were found to have a separation efficiency of 99.6% for trichloroethylene. (Erdelyi-FIRL)
W76-04218

ON THE EFFECTIVITY OF WASTE WATER BENTONITE FOR THE CLARIFICATION OF PAPER MILL EFFLUENTS (UBER DIE WIRKSAMKEIT VON ABWASERBENTONIT ZUR KLARUNG VON PAPIERFABRIKSABWASSERN),
W. Brecht, F. Borner, and H-L. Dalpke.
Das Papier, Vol 28, No 3, p 89-99, 1974. 3 fig 4 tab, 7 ref.

Descriptors: Pulp and paper industry, *Industrial wastes, *Bentonite, *Waste water treatment, Polyelectrolytes, Chemical precipitation, Laboratorytests, Flocculation, Sedimentation, Oxygen demand, *Pul wastes.

Clarification experiments were conducted with several different paper mill effluents in which graduated amounts of waste water bentonite as well as a polyelectrolyte were added. During this laboratory procedure the effect on precipitation was investigated by determining the amount of isoluble matter, increase of transparency, and the reduction of oxygen demand. The latter was found by measuring the BSB5 and the CSB values. The main findings were a strong increase of flocculation and sedimentation. With nearly ten out of twenty partly highly loaded effluents, a residual content of less than 20 mg/liter insolubles was obtained. Adjustment of pH, however, is required. The decrease in oxygen demand was far less significant. (Murphy-FIRL)
W76-04220

THE EFFECT ON BRIGHTNESS STABILITY OF PULP CONSTITUTION AND WATER QUALITY,
Union Camp Corp., Princeton, N.J.
R. G. Barker, and H. M. Deutsch.
TAPPI, Vol 57, No 4, p 94-97, April, 1974. 2 fig, 5 tab, 12 ref.

Descriptors: Pulp and paper industry, *Industrial wastes,, *Waste water treatment, Water quality, *Pulp wastes.
Identifiers: Carboxyl, Carbonyl, Alum, Brightness reversion.

The effects on brightness reversion of changes in pulp carboxyl and carbonyl content, water quality, and addition of alum and rosin were investigated. Loblolly pine and hardwood kraft pulps bleached CEDED and CEHD were examined. All pulps tested showed a correlation between heat stability and brightness, with the brighter pulps being more stable. For this reason, comparisons were made at equal brightness. For untreated pulps, it was shown that the CEDED sequence produced more stable pulps than the CEDED sequence. Both reversion tests (dry heat and wet heat) showed that the low-carboxyl pulps were the most stable. Borohydride treatment to reduce carbonyl content did not improve reversion properties over normal CEDED pulps when compared at equal brightness. Treatments designed to lower the contents of the carboxyl, carbonyl, or pulp chloride were not effective in reducing the brightness reversion of sheets prepared with mill white water. Thus, improving pulp quality does not appear to be a feasible method of reducing brightness reversion when the comparison is made at equal brightness. Mill alum and rosin in combination increased the absorption coefficient of handsheets. (Murohy-FIRL)
W76-04221

WATER RECYCLING IN THE PULP AND PAPER INDUSTRY,
Buckeye Cellulose Corp., Memphis Tenn.
D. C. Haynes.
TAPPI, Vol 51, No 4, p 45-52, April, 1974. 38 ref.

Descriptors: *Pulp and paper industry, *Recycling, *Water reuse, *Waste water treatment, Pilot plants, Laboratory tests, *Pulp wastes, Industrial wastes.
Identifiers: Kraft mills.

A number of processes (laboratory proposals and plant operations) were evaluated for water recycling possibilities. Systems were evaluated on the basis of incentives for process installation. This analysis was carried out on departmental and mill-wide scales. The latest water recycling values were analyzed. The evaluation indicated that reported values for recycling are probably low. Thus, a new mill installation with the emphasis on practical recycling schemes shows a reuse factor of up to 1600% for a bleached kraft pulp mill. The all-industry recycling value last reported was 290%. (Murphy-FIRL)
W76-04222

A NEW COLOR REMOVAL PROCESS: A FIELD REPORT,
Uddeholms A.B. Hagfors (Sweden).
L. G. Anderson, B. Broddevall, S. Lindberg, and J. Phillips.
TAPPI, Vol 57, No 4, p 102-105, April, 1974. 8 fig, 2 tab.

Descriptors: Pulp and paper industry, *Waste water treatment, *Industrial wastes, Color, Liquid wastes, Costs, Biodegradation, Chemical oxygen demand, Biochemical oxygen demand, *Pulp wastes.
Identifiers: *Color removal.

A method way of cleaning effluents from bleach plants is described. A full-size installation using the process has been checked in continuous operation for more than one year. Percentage elimination figures were given for color, COD, and BOD. The color reduction efficiency had a significant environmental effect as color bodies are biodegraded very little in the recipient water. The system does not impair either the pulp quality or the production line. The fact than only liquors and no sludges are handled makes the system simple and more flexible. Captured pollutants are eliminated in the existing recovery system. The process gave a net benefit in heat and, if back pressure turbines were employed, in power. Cost aspects are also reported. (Murphy-FIRL)
W76-04223

FIBER RECOVERY INCREASES WAT REUSE AND REDUCES WASTE TREATME COSTS,
Dorr-Oliver, Inc., Stamford, Conn.
R. J. Mattison, and T. H. Bier.
TAPPI, Vol 57, No 4, p 66-70, April, 1974. 6 fi tab, 13 ref.

Descriptors: *Water reuse, *Recycling, Pulp paper industry, *Waste water treatment, Co Economics, Equipment, Industrial wastes, * wastes.
Identifiers: *Fiber recovery.

The recovery of useful fiber from waste strean the pulp and paper industry improves the w treatment equipment. This recovery depend classifying to select for long, clean fiber for sa reuse. Several mills have installed a syste recover fiber with high freeness and mini contamination. These are suitable for blea and other chemical treatment. Test program operating experience at these mills has show fiber recovery reduces waste treatment costs stantially. Waste treatment equipment req ments, fresh water requirements, and plant tenance requirements are reduced. Useful fi returned to process, and/or cash incom produced from the sale of the recovered Economic and operating data supported results. Fiber recovery from the plant sewe pay for the equipment and can eliminate solids loading on gravity-separating equipme process stations, recovery prevented clogg nozzles and permitted water otherwise sewe be reused as fresh water. (Murphy-FIRL)
W76-04224

CLOSED LOOP WATER-SYSTEMS AT RIVER VALLEY FACTORY,
Red River Valley Cooperative, Hillsboro, N.
T. E. Paxson.
Sugar y Azucar, Vol 69, No 2, p 39-42, Feb 1974.

Descriptors: *Waste water treatment, *Ind wastes, *Food processing industry, Water *Recycling, Closed conduits, North Dakota.
Identifiers: Zero discharge.

The new factory of the Red River Valley Co tive in Hillsboro, North Dakota, will have a capacity of 5,000 tons of sugar beets per yearly production of 75,000 tons of sugar, cost of $30 million. Braunschweigische M enbauanstalt (BMA) of Germany is respons its design and construction. All the water facility will be recycled. The five water employed at the factory are: beet transp beet wash water; condenser water, a comb of cooling water and condensate from evap and vacuum pans; condensed water, a high product resulting from condensation of liv used in the evaporating and sugar boiling as well as in the heat exchanger; sanitary used to wash down floors and equipment, as eliminate human waste; and, a fire system. (Murphy-FIRL)
W76-04225

CLOSED-LOOP FILTRATION SYSTEM MIDWEST SUGAR BEET PLANT MA HIGH WATER QUALITY,
River River Valley Cooperative, Hillsb Dak.
T. E. Paxson.
Filtration Engineering, Vol 5, No 1, p 1 January/February, 1974.

Descriptors: *Waste water treatment, * wastes, Food processing industry, Wat *Recycling, Closed conduits, North *Filtration.
Identifiers: Zero discharge.

Red River Valley Cooperative is constructing
tory in North Dakota which will have a slicing
city of 5,000 tons of sugar beets per day, a
ly production of 75,000 tons of sugar, and a
of $30 million. Braunschweigische Maschin-
uanstalt (BMA) of Germany is responsible for
esign and construction. All the water at the
ty will be recycled. The five water systems
oyed at the factory are: beet transport and
wash water; condenser water, a combination
oling water and condensate from evaporators
acuum pans; condensed water, a high-quality
uct resulting from condensation of live steam
in the evaporating and sugar boiling stations,
ll as in the heat exchanger; sanitary waters,
to wash down floors and equipment, as well
iminate human waste; and, a fire-control
m. (Murphy-FIRL)
04226

UDY OF RENOVATION OF PULP WASTE
ER--TREATMENT OF UNBLEACHED
FT PULP WASHING WASTE WATER
I LIME, (IN JAPANESE),
rnment Industrial Research Inst., Takamatsu
n).
to, T. Kubo, and Y. Kimura.
on Kagaku Kaishi, No 10, p 1980-1986, Oc-
1973. 9 fig, 5 tab.

iptors: *Pulp and paper industry, *Industrial
s, *Wastes water treatment, *Lime, Pilot
, Chemical precipitation, Suspended solids.
fiers: *Lignin removal.

moval of lignin in unbleached pulp washing
water by lime treatment was studied by a
uous flow process. About 80% of lignin was
ed by the lime treatment, and was indepen-
f initial lignin content and of lime dosage
one gallon per liter. This result suggets that
of lignin component is not removed by the
reatment. In the precipitation of dissolved
n as carbonate, large particles identified as
were obtained at about pH 11. Seed crystals
ffective in their precipitation. On the basis
e results, a slurry recirculation carbonator-
r was devised for a pilot plant. As a result
continuous treatment test, the suspended
the effluent ranged from 20 to 70 ppm at
linear velocity in the clarifier was 80 cm/hr.
y-FIRL)
4227

ES ON AEROBIC CULTIVATION OF
TO REDUCE POLLUTION POTENTIAL
TILLERY WASTES,
ja Sayajirao Univ. of Baroda (India).
of Technology and Engineering.
harma, N. M. Bhatt, D. Kantawla, and M.
engar.
Journal Environmental Health, Vol 15, No
-126, April, 1974. 5 fig 3 tab.

tors: *Waste water treatment, *Industrial
*Food processing industry, *Yeast,
nical oxygen demand, Chemical oxygen
, Hydrogen ion concentration, Biological
nt, Microorganisms, *Aerobic conditions,
on.
rs: *Distillery wastes.

0 waste samples collected from a distillery
extended period of time were analyzed.
te had a pH between 3.6 to 4.7, total sugar
of 1.3 to 3.9%, BOD of 25,000 to 69,000
and COD of 70,000 to 150,000 mg/liter. A
lture of Saccharomyces cerevisine was
to the distillery waste water and optimiza-
ies were made to determine optimum pH,
eration and inoculum size to obtain max-
owth of yeast and maximum reduction in-
ar and BOD. The aeration was carried out
ake flask method. It was possible to adapt
t to 100% distillery waste without any
addition. The growth of the adapted yeast was 0.224 mgm/mg of total sugar as compared to 0.116 mgm/mg of total sugar for the wild yeast. The optimum pH range was 5.0 to 5.5 and the optimum inoculum dosage was 85 mgms of dry yeast per 70 mls of the waste. Under optimum conditions of pH and inoculum, optimum aeration periods ranged from 90 to 120 hours. Total sugar and BOD reductions at 60% and 57.5%, respectively, were obtained under optimum conditions. (Murphy-FIRL)
W76-04228

MASSIVE SSL POLLUTION PROJECT COMPLETED,
J. Kalish.
Pulp and Paper International, Vol 16, No 1, p 49-50, January, 1974. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Water pollution control, Foreign research, Suspended solids, Pollution abatement, Environmental engineering.
Identifiers: Sweden.

The Swedish pulp and paper industry has completed a massive, three-year SSVL Environmental Care Project costing 27 million Sw. cr. The project is unique in that it was initiated and financed largely by the industry, and involved the small companies as well as the large ones. Competitive barriers were broken as personnel from various companies moved freely through the pilot plants and testing facilities of other companies. The study has provided a statistical picture of the industry with respect to the environment, allowed for formulation of basic guidelines for the application of existing technology, and inspired continued interest in environmental problems within the industrial community. The study was begun with definition of several problem areas to be studied: systems closure, evaporation and condensate treatment, accidental discharges, bleaching, sludge treatment, biological and chemical treatment of effluents, and air pollution abatement. (Murphy-FIRL)
W76-04229

SERPENTINE AS ADSORBENT FOR REMOVAL OF PHOSPHATES FROM WATER,
Nevada University, Reno, Dept. of Chemical and Metallurgical Engineering.
R. W. Smith.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-249 666, $4.50 in paper copy, $2.25 in microfiche. Nevada Center for Water Resources Research, Reno, Completion Report, November 1975. 52 p, 23 p, 10 tab, 9 ref. OWRT A-060-NEV(1). 14-31-0001-5028.

Descriptors: *Phospates, *Adsorption, Mineralogy, *Waste water treatment, Separation techniques, Sorption, Ions, *Electrophoresis, *Oxides.
Identifiers: *Serpentine, Olivine, Chrysotile, Linde A.

Among the processes that have been suggested for phosphate removal from wastewater are sorption processes using either activated alumina or fly ash as adsorbents. Other substances, however, might be superior to alumina or fly ash either because of inherent superiority, cost or local availability. In this study serpentine was used as an adsorbent and precipitant for aqueous phosphate ions. For comparison, a number of adsorption experiments have been erformed using Linde A and olivine. Additional information on adsorption processes were obtained from electrokinetic measurements on the minerals, particularly serpentine, under varying pH phosphate concentrations. The adsorption capacity of PO4 onto various minerals decreases in the sequence chrysotile > olivine > serpentine (NY) > serpentine (CAL) > Linde A (A1203). The pH ranges of greatest PO4 adsorption are chrysotile-pH 4-10, Serpentine (CAL)-pH2, Olivine-pH2, Linde A-pH2, and Serpentine (NY)-pH2. (Fallin-Nevada)
W76-04233

ANNUAL REPORT 1973.
Canada Centre for Inland Waters, Burlington (Ontario); and Environmental Protection Service, Burlington (Ontario). Waste Water Technology Centre.
1974. 13 p, 17 fig, 5 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Mine drainage, Industrail wastes, Water quality control, Polychlorinated Biphenyls, Recycling, Oil spills, Equipment, Research and development.
Identifiers: Sludge dewatering, Phosphorus removal, Soil processes, Recovery.

Purpose, facilities, and current projects of each section of the Environmental Protection Service are described. For each major project or study, significant findings and results are given. These include development and demonstration of a variety of waste water treatment and reclamation processes. The Environmental Emergency Branch focuses on oil spill equipment and countermeasures. (Environment Canada)
W76-04238

FISH PROCESSING OPERATIONS LIQUID EFFLUENT GUIDELINES.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W76-04240

USE OF LIME IN THE TREATMENT OF MUNICIPAL WASTEWATERS,
Domtar Ltd. Research Centre, Senneville (Ontario).
R. J. P. Brouzes.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 21, Environment Canada, Ottawa, Canada, Environmental Protection Service, Training and Technology Transfer Division (Water) (1974), 127 p, 3 append, 8 fig, 19 tab, 143 ref.

Descriptors: Water quality, Water pollution control, *Waste water treatment, *Lime, Fertilizers, Color, Turbidity, Iron, Magnesium, Hydrogen ion concentration, Phosphus, *Municipal wastes, *Phosphates.
Identifiers: *Phosphorus removal, Clarification, Carbonation.

The primary objective was to develop a process for treating municipal wastewaters based on the addition of lime. The principal parameters studied were the removal of phosphorus, suspended solids, COD, BOD, and microorganisms in order to produce an effluent suitable for discharge, with or without subsequent treatment. The addition of magnesium and/or iron salts was also studied to determine if phosphorus removal could be improved. In general, the addition of lime to pH 10.0 removed most of the phosphorus, but produced low quality effluent with regard to other characteristics. Addition of lime to pH 11.0 and 11.5 produced effluents of considerably improved quality. At pH 11.5, phosphates were reduced by 98 per cent; turbidity also was reduced by 98 percent; BOD and COD reduction averaged 74 per cent and 67 per cent respectively; suspended solids were reduced by 80 per cent and total coliforms were totally and consistently eliminated (from approximately 2 million/100 ml to zero in nine jar test trials). It was therefore probable that this effluent, if produced under optimal conditions, was of sufficient quality to be discharged to most Canadian bodies of water. Where further purification is desired, air stripping for ammonia removal and treatment with activated carbon, or ozone could be employed for further BOD reduction. Existing primary treatment facilities can be readily converted to a lime treatment system with some modifications. (Environment Canada)

W76-04242

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES, VOLUME II,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
J. C. Van Loon.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 25, Training and Technology Transfer Division (Water), Environmental Protection Services, Environment Canada, Ottawa, Canada, October 1975. 41 p, 2 fig, 15 tab, 12 ref, append.

Descriptors: *Heavy metals, *Sewage treatment, Sludge, Soil analysis, Vegetation, Erosion, Mercury, Acids, Sampling, *Canada, *Sewage sludge, *Waste treatment, Water pollution effects.
Identifiers: *Land disposal, Toronto, Acetic acid extractable metals, Strong acid extractable metals, Ontario.

In the previous year of this contract (1) studies were initiated in the following areas: (1) Sludge heavy metal characterization of North Toronto, Newmarket and Point Edward sewage treatment plants, (2) Heavy metal contamination of farm soils and vegetation resulting from sludge applications (Newmarket area). (3) Surface water, heavy metal contamination resulting from sludge disposal. (4) Assessment of analytical data. (See also W74-08397) During the present year, work was continued in all these subject areas. Heavy metal contamination studies of soils, vegetation, groundwater and surface water were carried out at the Burlington Skyway plant disposal farm and the North Toronto plant disposal area. A study of garden vegetable contamination due to the use of sludge for home gardening was also initiated. Again as in the previous year emphasis was placed on using standard reference materials to give validity to the analytical data. (Environment Canada)
W76-04244

NUTRIENT CONTROL IN SEWAGE LAGOONS, VOLUME II.
Pollutech Pollution Advisory Services, Ltd., Oakville (Ontario).
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 23, Training and Technology Transfer Division (Water), Environmental Protection Services, Environment Canada, October 1975. 57 p, 14 fig, 1 tab, append.

Descriptors: *Sewage lagoons, *Phosphorus, *Chemicals, Waste treatment, Sewage, Effluents, *Waste water treatment, Sludge, Biochemical oxygen demand, Laboratory tests, Temperature, *Nutrients, *Nutrient requirements, Canada.
Identifiers: *Alum, Chemical conditions, Ontario.

An investigation was conducted of the effects of chemical addition on the operation of sewage lagoons, and the physical and or chemical conditions in the lagoon on the removal of phosphorus. Laboratory lagoon simulators were used to evaluate the effects of temperature, chemical dosage and influent phosphorus concentration on the performance of a typical lagoon. Raw sewage from the Village of Shelburne, Ontario was used as feed for the simulators. The addition of 200 mg/l of alum effectively reduced phosphorus concentrations in the lagoon effluent to below 1 mg/l. Higher temperatures resulted in increased phosphorus in the effluent from untreated sewage. However the addition of alum at 200 mg/l minimized this effect. The achievement of steady state operation in a lagoon with an 80 day retention time was found to require several months operation. Alum dosage was the most important factor in the phosphorus removal process in the lagoon. All other factors investigated had a relatively minor effect on the phosphorus concentration in the chemically treated effluent. (See also W74-10043) (Environment Canada)

W76-04246

LAND DISPOSAL OF SEWAGE SLUDGE, VOLUME II, (APRIL, 1973-MARCH, 1974).
Guelph Univ. (Ontario). Dept. of Land Resource Science; and Guelph Univ. (Ontario). Dept. of Microbiology.
Canada-Ontario Agreement on the Great Lakes Water Quality, Research Report No. 24, Training and Technology Division (Water), Environmental Protection Services, Environment Canada, Ottawa, Canada, October 1975. 276 p, 9 fig, 200 tab, 16 ref, append.

Descriptors: *Sewage sludge, Runoff, Seasonal, Bromegrass, Corn(Field), Loam, Chemical analysis, Nitrogen, Metals, Copper, Zinc, Crop response, Crop production, Nutrient requirements, Soil treatment, *Canada, Waste disposal, Pollutant identification.
Identifiers: *Land disposal, Ontario.

The report covers runoff studies with Fall, Winter and Spring applied sewage sludge, field rate and source of sludge studies with bromegrass on a loam soil and with corn on a loam, a sandy loam and a clay loam soil. A greenhouse trial with different rates and sources of sludge on two soils at three pH levels is also reported. Fluid digested sewage sludges were used which came from calcium oxide treatment of Newmarket sewage, aluminum sulphate treatment of Point Edward sewage and ferric chloride treatment of North Toronto sewage. Chemical analyses of the sludges, soil nitrogen, crop yields and nutrient and metal content of crops are presented along with microbial studies of the sludges and the crops grown. Detailed descriptions of the soils used are also presente. In runoff studies high rates of sludge greatly increased nutrient loss from sloping land but metal losses were small with the sludges and rates used in this study. In general, there was some crop growth response to the sewage sludges but in two trials a smaller response to the aluminum sludge from Point Edward was observed than to the others. Nitrification studies and plant nutrient analyses lead one to believe that the aluminum sludge has provided less available nitrogen to the crops than the other sludges but this does not fully explain the poorer growth with aluminum sludge. This effect of Al sludge does not appear to be related to difference in uptake of nutrients or metals other than nitrogen. Differences in uniformity of chemical composition of sludges from the three plants is discussed. (Environment Canada)
W76-04247

STUDY OF THE WASTE CHARACTERISTICS OF FISH PROCESSING PLANTS, LOCATED IN THE MARITIME REGION,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-04252

REVIEW OF CANADIAN DESIGN PRACTICE AND COMPARISON OF URBAN HYDROLOGIC MODELS.
Maclaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 5G.
W76-04254

PROCESS FOR CONDITIONING SEWAGE SLUDGES,
Rheinstahl A.G., Dortmund (West Germany). (Assignee)
N. Rosler, W. G. Rudat, and E. Albrecht.
US Patent No 3,922,221, 6 p, 1 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 940, No 4, p 1939, November 25, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Sludge treatment, Dehydration, Sludge disposal, Flocculation, Incineratio
Proteins, Separation techniques, Hydrogen i
concentration.

The sludge is atomized into small droplets
directed into the upper end of a readction to
through which is passed a hot gas atmosphere.
sludge is collected in a bath at the bottom of
tower and is conveyed to a station at which a fl
culant is added and it is then passed to the de
for carrying out its dehydration. It has been fo
with the invention that the proteins in the slu
droplets are denatured irreversibly by the hot
atmosphere practically immediately, and
proteins lose their water-binding capacity
coagulating. At the same time, the proteins bin
themselves other dehydration-inhibiting
stances so that with the subsequent flocculant
dition, a very high efficiency is obtained. Since
sludge elimination, a sludge burning system
follows the dehydration, a particularly simple
expedient form of the invention provides tha
sludge droplets are passed through a CO2-con
ing flue gas atmosphere coming from the
bustion system. The flue gas atmosphere b
about another feature, i.e. that the sludge dro
are acidified, on being heated to pH values b
4. The combined action of sudden heating and
ficiently acid basicity of the sludge droplets
to an additional precipitation of other substa
difficult to filter off. Lime is added as a neut
ing agent, by which the fatty acids contained
sludge are transformed into insoluble lime
which are easy to separate on dehydrating. (S
OEIS)
W76-04269

APPARATUS FOR TREATING W
WATERS,
Etudes et Procedes d'Assainissement Pu
Rennes (France). (Assignee)
R. Lewandowski.
US Patent No 3,922,224, 8 p, 7 fig, 7 ref, O
Gazette of the United States Patent Offic
940, No 4, p 1940, November 25, 1975.

Descriptors: *Patents, *Waste water trea
*Industrial wastes, Water pollution control,
quality control, *Heavy metals, Chemical
tions, Reduction(Chemical), Sep
techniques, Ion exchange, Copper, Cad
Lead.
Identifiers: Electro-plating industry.

The invention provides an apparatus for el
ing the undesirable ions in waste water by
cal displacement so as to recover metals no
form of salts but in the form of metallic
precipitating in the form of pulverized met
effluent containing copper, cadmium, pal
lead and tine is passed through a bed cont
mixture of sand and metallic particles resti
performed bed plate mounted above a c
ously pressurized gas compartment. The
particles are from the class of metals in
iron, aluminium and zinc having a high
tromotive voltage than the waste meta
waste metals attach themselves to the par
higher electromotive voltages as the elec
rent turns the bed into a cathode and ca
electro-chemical action which prevents
faces of the particles from oxidizing. The
bles up through the bed with a force wh
tinuously agitates the sand and particl
ciently to produce an abrasive action
sand and metal particles. (Sinha-OEIS)
W76-04270

METHOD AND APPARATUS FOR MEA
SEWER SEDIMENTATION INFILT
AND FLOW,
For primary bibliographic entry see Field
W76-04275

OD AND APPARATUS FOR COMPACT-UID SLUDGES,
Alsthom, Grenoble (Franche). (Assignee)
olios, and M. Merle.
nt No 3,923,652, 5 p, 3 fig, 7 ref; Official of the United States Patent Office, Vol 1, p 314, December 2, 1975.

ors: *Patents, *Sludge, *Sludge treat-ndustrial wastes, *Waste water treatment, lation, Water pollution treatment, Com-Pressure, Equipment.
rs: Secondary flocculation.

ry flocculation is obtained by adding floc-agents to the liquid in which the primary ion has been started up. The first fine ag-ed substances or small flakes which are solid and not very dense are gathered into large flakes. After having effected ary and secondary flocculation, a non-ious sludge is formed by large bous flakes each retaining its unity, with, each flake, clear interstitial liquid or slight controlled stirring of the sludges their settling and allows the removal of d the removal of damp solid substances to nged. The controlled stirring of the sludge d mechanically, slowly, at all points, by blades placed in the tank containing the d formed with holes which are well deter-r obtaining the settling of the flakes of The sludges thus settled are extracted he bottom of the tank, by a perforated crew rotating slowly in a conical recess int, constituting the sludge outlet orifice, d downwards, so that the discharge of creases as the extraction orifice of the approached, so as to send the interstitial ich is between the flakes back towards d to make the latter come out in a com-towards the orifice. (Sinha-OEIS)
g

ETECTION SYSTEM,
Investments, Inc., Fort Meyers, Fla.
)
Kinney.
t No 3,923,655, 5 p, 7 fig, 3 ref; Official f the United States Patent Office, Vol p 315, December 2, 1975.

rs: *Patents, *Sewage treatment, *Waste eatment, *Water pollution control, l sludge, Temperature, Measurement, effluents, Instrumentation, Settling

: Sedimentation tanks.

tion provides a method and apparatus ng and controlling the level of sludge in ttation tank of a sewage treatment addition to the heat generated by the al reaction in the aeration tank, the l equipment used for aeration, mixing ation in the activated sludge of a sewage system also generates heat. Normally e together with activated sludge is from the aeration tank to a secondary ion tanks where the sludge and super-tained under quiescent conditions for a n hour or more. In the sedimentation of motion and the low metabolism of isms in the activated sludge permit the ose some of its heat energy to at-and to the ground around the tank. mperature differential is established e incoming activated sludge and the he surface of the sedimentation tank. s respiration by the microorganisms or n the activated sludge will also release eate a temperature differential between rated activated sludge layer adjacent of the tank and the settled supernatant liquid above the activated sludge in the use of multiple probes space verti-the tank for determining temperatures at various levels in the tank or by the use of a probe on a vertically movable line or gear strip, it is possible to determine the vertical temperature differentials within the tank and to thereby locate the activated sludge layer. (Sinha-OEIS)
W76-04279

PACKAGE AEROBIC WASTE TREATMENT SYSTEM,
Multi-Flo, Inc., Dayton, Ohio. (Assignee)
J. R. Krebs, and T. G. Abele.
US Patent No 3,923,656, 6 p, 8 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 315-316, December 2, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Aerobic treatment, *Aeration, Water pollution control, Filtration, Aerobic bacteria, Domestic wastes, Septic tanks.

An aerobic package sewage treatment system is particularly adapted for domestic use. It is compact in configuration and releatively easy to install and operate, and thus especially adapted for use in isolated locations where service and maintenance are not readily available. A main holding tank is provided in which are suspended a number of porous bags which not only serve as filters but also provide a habitat for aerobic bacterial colonies and function as conduits for the final effluent as it passes from the holding tank. Sewage is delivered to the holding tank through a surge chamber positioned above the holding tank and an aerator mounted near the bottom of the holding tank draws air into the system to provide oxygen and produce an environment conducive to the propogation of aerobic bacteria while also ensuring a positive circulation within the holding tank. The effluent resulting from the aerobic decomposition of the waste material passes through the walls of the porous bags and flows upwardly within the bags into an effluent chamber. It then passes over the weir and out of a discharge outlet. The porous bags are formed of a non-corroding and nondeteriorating material such as a synthetic material and serve not only to remove all solids from the treated material, but also accommodate bacterial life on their outer surfaces. (Sinha-OEIS)
W76-04280

COMBINED SEPTIC TANK INLET PIPE SIGHT GLASS END PLUG AND TANK AERATOR SYSTEM.
K. F. Roser.
U.S. Patent No 3,923,657, 5 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 316, December 2, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Septic tanks, Domestic wastes, Conduits, Aerobic treatment, *Aeration, Cleaning.
Identifiers: Sight glass.

The investigation provides an improved sight glass which incorporates an assembly permitting the aeration of the septic tank contents and the aeration means may be introduced into an existing septic tank system by way of the inlet pipe leading from the building basement to the underground septic tank. A port within the cylindrical housing permits water under pressure to impinge against the glasswindow to clean the window and flush inlet pipe to the septic tank. A thin tube air conduit projects through the cylindrical housing and has attached to it a coiled flexible plastic pipe which terminates in a porous aeration element. A conical piston is fixed to the aeration element and a vibrating air pump supplies air to the coiled flexible pipe and aeration element. The flow of sewage through the inlet pipe or the water under pressure in cleaning the sight glass drives the piston through the length of the pipe and into the septic tank where the air escaping from the porous aeration element provides aerobic action to the sewage within the tank and to the leach field downstream. (Sinha-OEIS)
W76-04281

APPARATUS FOR PROCESSING FLUSHING LIQUOR FROM A GAS MAIN OF COKE OVENS,
Otto (C.) and Co., G.m.b.H., Bochum (West Germany). (Assignee).
H. Ullrich.
U.S. Patent No 3,923,659, 4 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 316, December 2, 1975.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, *Water quality control, Industrial wastes, Settling basins, Recycling, Reclaimed water, Treatment facilities, Heating, Equipment.

Flushing liquor from a gas main of a coke oven undergoes separation in a tank to obtain water which is essentially free of tar and solids and to obtain tar which is essentially free from water and solids. To accommodate the special requirements for the tar and solid separations, two separate groups of inclined settlement surfaces are provided in a common tank wherein solids are separated from the water and from the tar. The settlement surfaces of each group have bottom entries for liquid to be treated. The entrance ways to the two groups are at such heights that the entry to the water receiving group is placed above a tar-water phase boundary in the tank and the entry to the tar receiving group is placed below this boundary. Above both groups of inclined settlement surfaces are ajustable overflows which are adjusted to form the tar phase boundary at the desired elevation in the tank. Preferably, the two groups of inclined settlement surfaces are placed in a consecutive relationship and separated from one another by an inclined wall in the tank. To accelerate separation of water from the tar, indirect heating is provided below the group of settlement surfaces used to separate water from the tar. Along the long and short sides of the tank, side chambers are provided to receive clean water flowing from the overflows above the first and second groups to inclined settlement surfaces. A chamber for collecting the tar is provided in a similar way. (Sinha-OEIS)
W76-04282

MAGNETIC APPARATUS FOR TREATING LIQUIDS CONTAINING CALCAREOUS MATTER,
M. F. Kottmeier.
U.S. Patent No 3,923,660, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 317, December 2, 1975.

Descriptors: *Patents, *Waste water treatment, *Demineralization, *Water quality control, Water purification, *Calcium compounds, Hardness(Water), Separation techniques, Equipment.
Identifiers: Magnetic fields, *Magnets.

Mineral bearing water is treated magnetically by causing it to move in both an elongated path and a direct path past a magnetic field provided by a magnet array held in a number of elongated tubes supported in the flutes of a central fluted tube. The elongated path is provided by a helix surrounding the magnet array, and the direct path is provided by the central tube. The magnets arranged in the N-N and S-S relationship and the magnetic fields created are enhanced by separation of the like poles by non-ferrous material within the tubes supporting the magnets. A multiplicity of magnets are held in individual tubes holding a number of magnets with their poles in opposing relationship, each tube being held in the flute of the tube having a multiplicity of flutes, with the poles of the magnets in each tube aligned with the poles of the magnets in an adjacent tube, all of the aligned magnet poles being of like polarity to increase the flux density. (Sinha-OEIS)
W76-04283

FLUID PURIFICATION DEVICE,
For primary bibliographic entry see Field 5F.
W76-04285

REVERSE OSMOSIS APPARATUS,
United Kingdom Atomic Energy Authority, London (England). (Assignee).
For primary bibliographic entry see Field 3A.
W76-04286

APPARATUS FOR PHOTO-OXIDATION OF WATER,
Toray Industries, Inc., Tokyo (Japan). (Assignee).
M. Hirose, M. Otani, K. Yamada, N. Mitani, and K. Tanaka.
U.S. Patent No 3,924,139, 5 p, 15 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 443, December 2, 1975.

Descriptors: *Patents, Water purification, *Water treatment, *Waste water treatment, Tertiary treatment, *Oxidation, *Ultraviolet radiation, Water pollution treatment, Water quality control.
Identifiers: *Photo-oxidation.

An improved photo-oxidation apparatus for purifying water has at least two reaction chambers each connected with each neighboring chamber through a passageway, and which has in each reaction chamber an ultarviolet light source dipped practically vertically into the water to be treated and fixed by holders placed above the surface of the water. The apparatus is also equipped with gas suppliers, placed near the bottom of each ultraviolet light source in order to agitate waste water in that vicinity. Through these gas suppliers gas, usually containing oxygen, is supplied. The apparatus is also equipped with inlets for oxidizing agents, catalysts or photosensitizers in at least two of these chambers. The object is to achieve efficient reaction by means of several reaction chambers, each separated from each neighboring chamber except for a small water passageway between them. The passageway prevents any significant back flow or reverse mixing while permitting thorough mixing to occur in each chamber. (Sinha-OEIS)
W76-04287

DISPOSAL OF EFFLUENT FROM A BEEF CATTLE FEEDLOT RUNOFF CONTROL HOLDING POND,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5E.
W76-04290

LOW SULFIDE UNHAIRING AND ITS ADVANTAGES FOR THE TANNER,
BASF Wyandotte Corp., Detroit, Mich.
H. F. Buettner.
The Leather Manufacturer, Vol. 91, No. 8, p 20-23, August, 1974.

Descriptors: *Sulfides, *Industrial wastes, *Tannery wastes, *Waste water treatment, Effluents, Lime, Biodegradation.
Identifiers: *Leather, Sodium sulfite liming.

Due to increased environmental concern, tanneries must now solve the problem of clarifying strongly toxic, sulfide-containing tannery effluents. Sulfide-free or low-sulfide unhairing systems are needed, due to the high maintenance and investment costs of factory owned effluent treatment plants, the high costs of discharging effluents into a municipal treatment plant, and strict regulations concerning sulfide content, BOD and general quality of the effluent. Many unhairing systems have been suggested and rejected for various reasons such as cost, insufficient opening of the collagen fiber system, or too severe opening of the hide structure. A reductive liming process is described which uses the BASF Wyandotte Corporation product Mollescal SF instead of sodium sulfide or sodium sulfhydrate in conjunction with hydrated lime. The effluent of Mollescal SF lime liquors contains almost no sulfide ions and the protein substances remaining can be easily removed by biodegradation. Leathers processed by the Mollescal SF method have much finer and tighter grain and less pronounced and more easily set out growth marks than the grain and growth marks of leather processed by standard sodium sulfite liming techniques. (Orr-FIRL)
W76-04292

OXIDATION DITCH TREATMENT OF ANAEROBIC LAGOON EFFLUENT OF DISTILLERY WASTE,
Walchan Coll. of Engineering. Sangli (India). Dept. of Civil Engineering.
B. S. Rao.
Journal of the Institution of Engineers (India), Vol. 54, No. 3, p 97-99, June, 1974. 1 fig, 2 tab, 9 ref.

Descriptors: *Oxidation, *Lagoons, *Anaerobic conditions, *Waste water treatment, Biochemical oxygen demand, Standards, Effluents, Capital costs, Operating costs, Irrigation, Industrial wastes.
Identifiers: Distillery waste waters, Bench scale models, Oxidation ditchs.

The Institute of Standards of India has issued a draft standard of a 100 mg/liter BOD limit for distillery waste water discharged into inland surface waters. Distillery wastes have been successfully treated in anaerobic lagoons and the lagoon effluent diluted six to eight times with fresh water and then used as irrigation water. However, it is now necessary to find a suitable treatment to dispose of the waste on land or in surface streams without the addition of fresh water because of a shortage of dilution water or a lack or irrigation facilities at some of the distilleries. A bench-scale model was used to study the treatement by oxidation ditch method of the effluent from anaerobic lagoons which provided the initial treatment of distillery wastes. The results of the experiment demonstrated that treatment of a lagoon effluent by oxidation ditch can reduce the BOD of the effluent to 100 mg/liter. An organic loading of 0.12 kg BOD/kg MLSS was found to be the optimum to achieve 98 percent BOD removal efficiency. The capital cost of constructing an oxidation ditch capable of treating a lagoon effluent quantity of 350,000 liters/day was estimated as Rs 300,000; the running expenditure was calculated to be Rs 20,000 per year. (Orr-FIRL)
W76-04293

TREATMENT OF WHEAT STARCH WASTE BY ACTIVATED SLUDGE (2) ON THE EFFECT OF PH AND BOD LOADING (KASSEI ODEI NI YORU KOMUGI DENPUN HAISUI NO SHORI (2) PH OYOBI FUKARYO NO EIKYO),
T. Fukada, S. Umemoto, K. Tada, and H. Kitamura.
Hyogo-ken Kogai Kenkyusho Hokoku, No 5, p 38-41, 1973. 5 fig, 1 tab, 13 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Activated sludge, Biological oxygen demand, Sludge, Hydrogen ion concentration.
Identifiers: Sludge volume index(SVI).

Treatment of wheat starch wastes by the activated sludge process was studied. With a pH value of 5.5 to 7.0 in the mixed liquor, the suppression of growth of filamentous organisms was observed, and the sludge volume index (SVI) was relatively satisfactory. In the case of high waste concentration, one of the major causes of decreasing SVI was pH. The effect of BOD loading, and application of Katz's equation and Menten's equation were studied. It was assumed that if BOD loading was less than 0.40 kg/kg day, then the effluent BOD value was less than 100 ppm. Relationships between oxygen utilization rate and BOD concentration or removal were investigated. At the same BOD concentration, the oxygen utilization rate of the highly purified mixed liquor was low. (Murphy-FIRL)
W76-04294

ARIZONA RULES AND REGULATIONS SEWERAGE SYSTEMS AND WASTE T MENT WORKS.
Arizona State Dept. of Health, Phoenix.
For primary bibliographic entry see Field 5C
W76-04368

COLORADO REGULATIONS FOR EFF LIMITATIONS; TREATMENT WORKS APPROVAL REGULATION; STORM S DISCHARGE REGULATIONS.
Colorado Water Quality Control Comm Denver.
For primary bibliographic entry see Field 2
W76-04375

CHEMICAL ANALYSIS AND PROCESS SIFICATION OF CONSTITUENTS O FLUENTS (ORGANIC NITROGEN I TIVATED CARBON EFFLUENTS),
Connecticut Univ., Storrs. Inst. of Resources.
For primary bibliographic entry see Field 5
W76-04387

BIOTIC CHANGES IN THE WIL TIC/SHETUCKET RIVER ASSOCIATE IMPROVEMENTS IN SEWAGE TREAT
Connecticut Univ., Storrs. Inst. of Resources.
For primary bibliographic entry see Field
W76-04388

ANIMAL WASTE MANAGEMENT IN PRODUCTION SYSTEMS,
New York State Coll. of Agriculture Science. Dept. of Poultry Science.
For primary bibliographic entry see Field
W76-04414

AN ASSESSMENT OF THE AGRICU AND PROCESSING WASTE PROBLE CONTROL IN WEST VIRGINIA,
West Virginia Univ., Morgantown. A Experiment Station.
For primary bibliographic entry see Field
W76-04415

TREATMENT AND DISPOSAL OF WASTES IN MASSACHUSETTS,
Massachusetts Univ., Amherst.
J. T. Clayton.
Presented at Conference on Agricu Processing Wastes in the Eastern Regi spective, Philadelphia, Pennsylvania, D 3, 1970, p 61-67.

Descriptors: *Farm wastes, *Mas *Waste treatment, *Waste disposal, Re development, Aeration, Effluents, Groundwater, Lagoons, Ponds, Design.
Identifiers: Land disposal.

In an attempt to provide usable enginee information, studies of several com treatment systems are being conduc study are the following: (1) An extend system of manure mixed with water to ry. (2) The effects of disposal of efflue above mentioned system at a subsurf terms of chemical, microbiological, a properties of constructed profiles, as degree of tertiary treatment in the s tribution of animal waste effluents wi with an orifice or nozzle that can rel uniform discharge. (4) Flow of nitro the soil with the purpose of establish fect adsorption of nitrogen by soil par have on nitrogen contamination of gro the vicinity of waste stabilization po effects of groundwater on the m nitrogen in soils adjacent to lagoon (Merryman-East Central)

4418

OT WASTE DISPOSAL AND WATER TION,
do State Univ., Fort Collins. Agricultural ion Service.
mary bibliographic entry see Field 5B.
419

TION-CONTROL TECHNIQUES AND REMENTS,
Univ. at Urbana-Champaign. Dept. of tural Engineering.
nary bibliographic entry see Field 5G.
420

WASTE STORAGE PONDS FOR SOIL-RECYCLING,
ia Univ., Riverside. Agricultural Exten-vice.
irbanks, E. H. Olson, and G. A. Hutton,

ty of California, Agricultural Extension, on No. AXT-n88, November, 1972, 6 p, 3

ors: *Dairy industry, *Waste storage, Ir- Design, *Liquid wastes, Storm runoff, eaning, Waste treatment, Waste disposal. rs: *Land disposal, *Pond management.

ith the ultimate beneficial return to the ste storage ponds provide a system for t, settling, and storing liquified dairy nd washwater for re-use in barn cleaning ure transport. When ascertaining the ty of the liquid-waste ponding system how it relates to the cow confinement manure transport, work simplification, nagement, neighborhood acceptance and performance in all weather conditions. in which the dairy waste storage ponds the requirements for storm runoff con-utlined. Design of a waste management ould be based on cost, safety and per- The aspects of the liquid-waste ponding at are examined are: (1) pond layout, (2) me calculation, (3) pond depth, (4) l slopes, (5) pond sealing, (6) pipes, (7) nd (8) fencing. Pond management in- practice of emptying and flushing the each irrigation. Manure waste water t exceed 30 percent of the irrigation The necessary equipment for such nt is listed. Odor control and cleaning of re also discussed. (Penrod-East Central)

WASTE PROBLEMS AHEAD,
Univ., Lexington.
y bibliographic entry see Field 5E.

OF A FULL-SCALE SWINE WASTE SYSTEM,
niv. (Ontario). Inst. of Environmental d Engineering.
and N. K. Patni.
arch, Vol. 6, p 1425-1432, 1972. 8 fig, 1

: *Farm wastes, *Hogs, *Oxidation Vaste treatment, Biochemical oxygen Chemical oxygen demand, Waste lor.
Ditch mixed liquor, Organic carbon, l.

f disposal of large amounts of animal s when confinement livestock breed- l. There is an increasing trend towards of breeding and the problem is mag- land application of the manure

produced is not feasible. Because of their simplicity and economy, oxidation ditches are being considered more often as a means of partially or completely stabilizing livestock wastes. Findings are reported on the biological efficiency of oxidation ditches in reducing organic carbon. The oxidation ditch was a satisfactory unit for treating swine wastes for the reduction of BOD and COD loads. If the manure is mixed with poorly biodegradable bedding material, it is desirable to screen the wastes for large solid materials before introducing them into the ditch. Foaming should be considered in the design of a unit, particularly when in-the-building oxidation ditches under slatted floors in the pens are used, as excessive foaming was often a serious problem. For odor control, better DO distribution in the entire mixed liquor mass is desirable. Two methods of achieving this are using extra rotors or using direct air injection into the ditch mixed liquor. (Penrod-East Central)
W76-04425

CHEMICAL COAGULATION OF FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
R. J. Smaus.
MS Thesis, May, 1972, 60 p, 25 fig, 7 tab, 23 ref.

Descriptors: *Farm wastes, *Waste treatment, *Feed lots, *Agricultural runoff, *Chemicals, *Coagulation, *Costs, Turbidity, Sludge, Color.
Identifiers: *Color reduction.

The treatment of feedlot runoff by chemical coagulation was evaluated, with color reduction as the prime goal. The removal of organic matter and other desirable effects were also anticipated. Alkalinity was important in the chemical coagulation process. Turbidity and apparent color can be reduced by the application of moderate amounts of coagulants, whereas the colloidal color, believed to be hydrophilic, requires large dosages of coagulant for significant removal. The reduction of the total solids, suspended solids, and COD may be related to the reduction of turbidity. Feedlot runoff can be clarified by coagulation using the common metallic coagulants. Estimated chemical costs of such treatment are in excess of $1.00 per 1000 gallons. From the chemical costs involved and the large volume of chemical sludge produced, chemical coagulation does not appear to be a practical method of treating this waste. (Cartmell-East Central)
W76-04426

FARM WASTE DISPOSAL.
Ministry of Agriculture, Fisheries and Food, Pinner (England).
For primary bibliographic entry see Field 5E.
W76-04427

MANURE HOLDING PONDS FOUND SELF-SEALING,
J. L. Meyer, E. Olson, and D. Baier.
California Agriculture, Vol. 26, No. 4, p 14-15, May, 1972.

Descriptors: *Farm wastes, *Farm lagoons, *Waste storage, Water pollution, *Poultry, *Dairy industry, *Waste water treatment, Salts, Sludge, Biochemical oxygen demand, Nitrogen, California.
Identifiers: *Manure holding ponds(Self sealing).

Findings in a study of waste pond operations are reported. In the past, waste waters from poultry and dairy operations flowed to stream beds where they became part of the stream. Improved practices are imperative, since such waste waters are high in BOD, nitrates, dissolved solids, offensive constituents, and bacteria. One alternative available to handle animal wastes is the use of manure waste ponds. A test was run on 17 ponds in California which represented a wide range of soil textures, water table depths, and age. Apparent anaerobic nitrogen losses of considerable magnitude occur under normal pond operation. Since much of manure dry solids is salt, ponds should be emptied frequently or whenever salt content reaches 2,900 ppm. After several months of use, levels of nitrate and salt in soil solutions from below ponds showed very small changes. There is a very low rate of water loss from manure ponds. Sludge which developed on each soil bottom had very low nitrate-nitrogen contents and very high BOD values. Seepage of water from the ponds amounted to only 1 mm per day. Soil solutions below the ponds had a lower concentration of all nutrients than adjacent well waters after 15 months. Thus artificial seals inside manure-laden reservoirs are not recommended. (East Central University)
W76-04428

GUIDELINES FOR CATTLE FEEDLOT DESIGN,
Montana State Univ., Bozeman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-04430

REVIEW OF RESEARCH AND RECOMMENDATIONS ON ANIMAL WASTE MANAGEMENT CONTROL MEASURES FOR MONTANA WITH SPECIAL REFERENCE TO BEEF CATTLE FEEDLOTS,
Montana State Univ., Bozeman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W76-04431

NEW WASTE TREATMENT SYSTEM IS USED FOR HOGS,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
E. P. Taiganides.
American Farmer, Vol. 47, No. 2, p 6-7, February, 1972.

Descriptors: *Farm wastes, *Waste treatment, *Separation techniques, *Liquid wastes, *Solid wastes, Odor, Biochemical oxygen demand, Aeration, *Hogs.
Identifiers: *Flushing.

Although liquid systems have made it possible to mechanize manure handling to a greater extent than is possible with solid systems, new odor and water pollution problems have been created. Automated waste handling systems which do not create water or odor pollution will probably be in great demand in years to come. This study examined a treatment system in which flushing the manure out of the building played an important role. Flushing accomplished two things: (1) It prevented the release inside the building of noxious gases which affect the health and comfort of both animals and of the people working inside the building; (2) It ameliorated the problems of dust and odor and it automated manure removal. Flushing also enhanced the treatability of the manure in the aeration units outside the building by speeding up the liquification of the organic solids in the manure. At peak performance, an effluent of extremely high quality was produced. The BOD of the effluent was from 30-140 ppm and pH ranged from 6.5 to 8.4. There were no odors. The effluent was treated in an oxidation ditch, clarified, and recycled through the building as flushing water. The solids were screened out, aerated in an aerobic digestor, and stored before being pumped out for final disposal. There was trouble in getting the aerator to work properly but the problem was presumed to be in the wiring. Before a conclusion could be drawn on plant efficiency, its performance in freezing weather would have to be studied. (Kehl-East Central)
W76-04436

GLASS MANUFACTURING POINT SOURCE CATEGORY--PROPOSED EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-04445

5E. Ultimate Disposal Of Wastes

INCINERATION DISPOSES OF REFINERY WASTES.
The Oil and Gas Journal, Vol 73, No 46, p 60-63, November 17, 1975. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, *Oil wastes, *Incineration, Waste disposal, Ultimate disposal, Burning, Sludge, Oily water, Oil pollution.
Identifiers: Refinery wastes.

Stricter control of landfills, and land scarcity are forcing refineries to consider incineration for the disposal of oily sludges and wastes. Although modern production methods allow the production of oily sludges to be kept to a minimum, several sources of oily wastes persist. If on-site incineration is chosen, the feed stock should be segregated and equalized. Economizing with instrumentation or control systems should be avoided and heat recovery is often not practicable with current technology. Oily wastes should be dewatered before incineration by using a 'thickener', centrifuge, or rotary vacuum filter. Commercially available incinerators consist of a refractory-lined chamber, firing equipment, means of introducing wastes, a system for ash removal, and instrumentation. Each of the following incinerator designs is discussed: box furnaces; vortex incinerators; cyclone incinerators; rotating-hearth incinerators; rotary-kiln incinerators; multiple-hearth incinerators; and, fluidized-bed incinerators. (Orr-FIRL)
W76-04021

WATER POLLUTION AND ITS CONTROL AT OIL REFINERIES,
National Environmental Engineering Research Inst. Nagpur(India).
For primary bibliographic entry see Field 5D.
W76-04025

WASTE WATER TREATMENT BY GAS INTAKE APPARATUS (KITAI MAKIKOMISOCHI NI YORU HAISUI SHORI),
For primary bibliographic entry see Field 5D.
W76-04034

EXPERIENCES WITH THE OPERATION OF STEP SWING GRATES, AND PLANS FOR THE COMBINED INCINERATION OF DOMESTIC REFUSE AND SEWAGE SLUDGE (BISHERIGE BETRIEBSERFAHRUNGEN MIT STUFFENSCHWENKROSTEN UND PLANUNGEN FUER KOMBINIERTE VERBRENNUNG VON MUELL UND KLAERSCHLAMM),
For primary bibliographic entry see Field 5D.
W76-04079

SPRAY RUNOFF DISPOSAL OF WASTE STABILIZATION POND EFFLUENT,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
For primary bibliographic entry see Field 5D.
W76-04161

EVALUATION OF THE BARBER - COLMAN WETOX PROCESS FOR SEWAGE SLUDGE DISPOSAL,
Ontario Research Foundation, Toronto. Dept. of Environmental Chemistry.
For primary bibliographic entry see Field 5D.
W76-04164

DISPOSAL OF LIQUID WASTE BY POWELL DUFFRYN PROCESS.
For primary bibliographic entry see Field 5D.
W76-04188

PROCESS FOR CONDITIONING SEWAGE SLUDGES,
Rheinstahl A.G., Dortmund (West Germany). (Assignee)
For primary bibliographic entry see Field 5D.
W76-04269

DISPOSAL OF EFFLUENT FROM A BEEF CATTLE FEEDLOT RUNOFF CONTROL HOLDING POND,
Agricultural Research Service, Lincoln, Nebr.
J. A. Nienaber, C. B. Gilbertson, T. M. McCalla, and F. M. Kestner.
Transactions of the ASAE, Vol. 17, No. 2, p 375-378, March/April, 1974. 1 fig, 6 tab, 11 ref.

Descriptors: *Agricultural runoff, *Feed lots, *Waste disposal, *Nutrient removal, Water pollution control, Equations, Rainfall, Irrigation, Design criteria, Effluents, *Farm wastes, Waste water treatment.
Identifiers: Beef cattle feedlot runoff, Land application, Waste disposal systems.

A field study was performed to determine the minimum area required to dispose of feedlot runoff as affected by applied nutrients. Water and disposal area runoff control requirements are discussed. A minimum area of one-half acre disposal area per acre of feedlot did not impair crop production or cause pollutant accumulation. There was no discrimination by cattle grazing on the effluent treated areas. An equation for the disposal area in acres was given: the disposal area in acres equals the summation of estimated annual rainfall in inches x the size of the feedlot in acres, all divided by the average irrigation total in inches. (Orr-FIRL)
W76-04290

MICHIGAN LIQUID INDUSTRIAL WASTE DISPOSAL ACT.
For primary bibliographic entry see Field 5G.
W76-04380

UNITED STATES GEOLOGICAL SURVEY'S HYDROGEOLOGICAL RESEARCH PROGRAMS AND PLANS RELATED TO DISPOSAL OF RADIOACTIVE WASTE INTO GEOLOGIC FORMATIONS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W76-04411

PLANT NUTRIENT BUDGETS AND WASTE DISPOSAL,
Connecticut Agricultural Experiment Station, Storrs.
For primary bibliographic entry see Field 5C.
W76-04416

A PERSPECTIVE FOR CONNECTICUT,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5B.
W76-04417

TREATMENT AND DISPOSAL OF ANIMAL WASTES IN MASSACHUSETTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5D.
W76-04418

DAIRY WASTE STORAGE PONDS FOR PLANT RECYCLING,
California Univ., Riverside. Agricultural sion Service.
For primary bibliographic entry see Field 5D
W76-04421

CRITICAL WASTE PROBLEMS AHEAD,
Kentucky Univ., Lexington.
I. J. Ross, B. J. Barfield, and H. E. Hamilto
Livestock Breeder Journal, Vol. 15, p. 2 274, July, 1972.

Descriptors: *Farm wastes, Livestock, Ox lagoons, *Agricultural wastes, *Waste d Lagoons, Recycling, Waste treatment, D tion, Injection wells, Waste disposal wells.
Identifiers: *Waste management, Land dis

Agricultural waste management proble been magnified by recent developments- sion of the suburbs into farming areas, ce tion of animal producing facilities, i production, use of chemical fertilizers, mand for processed food. Many new pract concepts are being tested in an effort these problems. Livestock waste polluti stitutes about 11 percent of all agricultur tion. Land disposal of these wastes is widely used disposal method. Microbial systems such as lagoons and oxidation rank second. Other systems include dehyd produce fertilizers, deep dispersal int wells, and various methods of (Merryman-East Central)
W76-04423

A STUDY OF A FULL-SCALE SWINE DISPOSAL SYSTEM,
Toronto Univ. (Ontario). Inst. of Envi Sciences and Engineering.
For primary bibliographic entry see Field W76-04425

FARM WASTE DISPOSAL.
Ministry of Agriculture, Fisheries a Pinner (England).
Short Term Leaflet 67, Amended 1973, 2

Descriptors: *Waste disposal, *Waste *Farm wastes, *Aerobic conditions, Anaerobic digestion, Livestock, Lega Pathogenic bacteria, Irrigation.
Identifiers: *United Kingdom, *Land di

When planning a waste disposal system tant to know how much and what kind will have to be handled. There are systems of manure handling: (1) solid, olid, (3) liquid slurry, (4) organic irrigati discharge into a public sewer. Aerobi treatment systems include (1) the oxid (2) the high rate biological filter tower surface aerator. In addition to manure fluent, washing down water, rainwater water used in the milking process m sidered when designing farm buildings tion of farm manure, it is normally rec that diluted cow slurry (1 part manu water) should be applied at up to 15, acre per annum in three separate applic legal aspects of waste disposal are cla Rivers Acts of 1951 and 1961, Resources Act of 1963, the Public He 1961 and 1969, and the Agriculture Act fectious organisms of concern are the group of bacteria and brucellosis. waste disposal system for a particular pendent upon the type of land, cropping policy, type of housing, sc prise, costs, river pollution, nuisanc possibility of hazards, and comfort men. Care should be taken not to agit storage tanks when the wind directi smells to houses, operate spray guns

vind, irrigate when the land is saturated, or effluent directly into a water course. es-East Central)
4427

ST LAND FOR MANURE DISPOSAL.
y Digest, Vol. 30, p. 553, November, 1971.

ptors: *Farm wastes, *Waste disposal, t management, *Nitrogen, Liquid wastes, dwater, Water pollution, Application rates. iers: Tanker spreader.

manure was applied with a tractor-drawn preader across a 30-ft swath in a white pine ion. It dried quickly and was dispersed by ithin two months. Flies were not attracted trees used the nitrogen effectively. Appli- rates must be governed to avoid nitrogen p in groundwater. (East Central University)
433

TO DISPOSE OF MANURE AND STAY F COURT,
nderson.
uarterly, Vol. 27, No. 4, p 52-56, 1972.

tors: *Farm wastes, Waste disposal, aspects, *Feed lots, *Cattle, *Dairy indus- sts, Irrigation, United States, Canada,

ers: Land disposal.

es and Canadian provinces now prohibit ge of untreated livestock manures from to surface or underground waters. Con- applicable law before starting or enlarging ation. Note the distances to downwind rs. Adequate spreading areas should be r held under long-term lease. Suggestions t estimates are given for beef, dairy, and erations. (East Central University)
435

ater Treatment and lity Alteration

INE DRAINAGE WATER MADE FIT NK.
ary bibliographic entry see Field 5D.
90

ERCURRENT FLOW OSMOTIC SSES FOR THE PRODUCTION OF ONS HAVING A HIGH OSMOTIC RE,
ty of the Negev, Beersheba (Israel). and Development Authority.
ary bibliographic entry see Field 3A.
35

TRIFUGAL METHOD FOR THE TION OF POLYMER MEMBRANES VERSE OSMOSIS,
Aeronautics and Space Administration, ield, Calif. Ames Research Center.
ry bibliographic entry see Field 5D.
6

ENT OF SEA WATER PRODUCES ALITY REACTOR COOLANT,
California Edison Co., Los Angeles,

ry bibliographic entry see Field 3A.
2

RIFICATION DEVICE,
t No 3,923,663, 5 p, 4 fig, 8 ref; Official f the United States Patent Office, Vol p 318, December 2, 1975.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Ultraviolet radiation, Disinfection, Filtration, Thin films, Waste water treatment.
Identifiers: Sterilization.

A unique combination of a fluid filter unit and fluid serilizing unit in a single housing is utilized with the filter unit surrounding the ultraviolet lamp, and a spaced tube of reflecting or non-reflecting materials which cooperate to provide a flow channel for conducting the fluid to be irradiated along the lamp envelope. The outer surface of the tube has an extremely thin film of hermetically sealed fluorinated ethylene propylene to prevent contamination and accumulation of scale or other impurities and yet permit transmission of a relatively large amount of ultarviolet rays. The lamp assembly is removably mounted within the body and extends through a reflector tube which not only conveys the fluid in a thin walled column over the lamp, but also reflects the ultraviolet rays back and forth through the fluid to increase irradiation. A tubular filter unit is removably fitted within the body and surrounds the reflector tube in a manner to communicate fluid passing through to one end of the reflector tube where it is conveyed along the length of the lamp to an outlet. (Sinha-OEIS)
W76-04285

APPARATUS FOR PHOTO-OXIDATION OF WATER,
Toray Industries, Inc., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W76-04287

POLYMER ADSORPTION AND ITS EFFECT ON THE STABILITY OF HYDROPHOBIC COLLOIDS. II. THE FLOCCULATION PROCESS AS STUDIED WITH THE SILVER IODIDE-POLYVINYL ALCOHOL SYSTEM,
Agricultural Univ., Wageningen (Netherlands). Lab. for Physical and Colloidal Chemistry.
G. J. Fleer, and J. Lyklema.
Journal of Colloid and Interface Science, Vol 46, No 1, p 1-12, January, 1974. 10 fig, 1 tab, 22 ref.

Descriptors: *Polymers, *Adsorption, *Colloids, *Flocculation, Mixing, Coagulation, Chemical reactions, *Water treatment, *Adsorption.
Identifiers: Polyvinyl alcohol, Silver iodide.

During invesigation of the interaction between hydrophobic colloids and polymers, the flocculation of silver iodide sol by polyvinyl alcohol was studied. The extent of flocculation depends on the method of mixing of sol and polymer. The flocculation is most effective if equal amounts of nearly completely covered AgI particles and uncovered particles are mixed. The apparent irreversibility of the adsorption of polymer molecules is essential for the dependence of the flocculation on the mixing order. A certain critical amount of salt is needed to bring about flocculation; thus the flocculation process may be referred to as sensitization. The critical salt concentration decreases with increasing valency of the counterion, approximately in the ratio 100:10:1 for KNO3, Ca(NO3)2 and La(NO 3)3. The salts reduce the Stern potential and compress the diffuse double layer to such an extent that the attachment of adsorbed loops on other particles is no longer electrostatically inhibited. The flocculation efficiency increases with increasing molecular weight and acetate content of the polymer. The better the polymeric flocculant, the less critical the way of mixing. The aggregation between polymer covered and uncovered particles is a bimolecular process. Silver iodide sediments formed upon flocculation with polyvinyl alcohol are loose and open; their volume decreases slightly upon standing. On the other hand, silver iodide sediments obtained by coagulation with salts have a higher volume during the first hours after their formation, but this volume decreases gradually. (Murphy-FIRL)
W76-04295

NATIONAL SAFE DRINKING WATER STRATEGY -- ONE STEP AT A TIME.
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
Draft Strategy Document, May, 1975. 83 p, 2 fig, 6 tab.

Descriptors: *Administrative agencies, *Potable water, *Public health, Legal aspects, Water law, Regulation, Federal government, State governments, Standards, Technology, Economic impact, Water pollution, Water pollution control, Local governments, Governmental interrelations, Environmental effects, Safety, Water quality control, Water pollution treatment, Water purification, Pollution abatement.
Identifiers: *Administrative regulations, *Safe Drinking Water Act.

This document outlines the strategy used by the Environmental Protection Agency (EPA) in implementing the Safe Drinking Water Act (SDWA). The report states that it is the policy of EPA to approach the problem of substandard drinking water on a step-by-step basis giving highest priority to matters of public health. The strategy emphasizes participation and decision-making on a local level. The overall goal of the program is to assure that the public has safe drinking water but the strategy recognizes that this goal cannot be acomplished overnight. Reasonable compromises will have to be made among all environmental programs, and where goals among the programs conflict, tradeoffs may be required. The report states the following program objectives and outlines the strategy related to the implementation of each objective: to insure an effective Federal-State partnership in the implementation of SDWA; to complete research, development, and demonstration projects which will provide technical information needed to accomplish the purposes of the Act; to carry out enforcement of the provisions of the Act; and to encourage consumer participation in implementation of the Act. (Nursey-Florida)
W76-04354

5G. Water Quality Control

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3C.
W76-04004

THE ECONOMICS OF SEWERAGE PRICING AND INVESTMENT POLICIES: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
N. W. Bouwes, and D. W. Bromley.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 503, $6.00 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, 1975. 127 p, 16 fig, 17 tab, 80 ref. OWRT B-087-WIS(2). 14-31-0001-4139.

Descriptors: *Sewerage, *Alternative planning, Water demand, *Pricing, *Investment, Water requirements, Water utilization, Mathematical studies, Prices, Economics, *Marginal costs, *Economic efficiency, *Water rates, Water policy, Decision making, Wisconsin.
Identifiers: Madison Metropolitan Sewerage District(Wis).

This study was undertaken in an attemp to address the shortcomings associated with management techniques of public utilities, in particular, pricing and investment policies. An examination of existing policies has revealed an absence of economic considerations in water resource management

philosophy. Present philosophy appears to consider water use insensitive to price; and consequently, has substituted water 'requirement' approach for the economist's 'demand' approach. Prices are use primarily for financing, purposes, rather than a tool for managing demand. Likewise, investment considerations do not appear to be predicated upon economic concepts; this is attributed in part to improper pricing, and other circumstances such as satisfying grant provisions which require 20-year time horizons by the grantee in their investment planning. These practices may be a result of the utility's emphasis on non-economic issues, or the belief that the benefits to be obtained from incorporating an economic approach to their decision making would not justify the costs. In any event, it is apparent that a cognizance must be made of the implications associated with alternative management practices. This then becomes the objective of this study--to make available a tool based upon the economics interactions of a system which allows management to evaluate possible alternative management policies.
W76-04008

SUMP DESIGN FOR OIL/WATER SEPARATORS,
Empresa Nacional del Petroleo, Concon, Chile.
For primary bibliographic entry see Field 5D.
W76-04022

CONTROL OF POLLUTION FROM PETROLEUM REFINERIES,
For primary bibliographic entry see Field 5D.
W76-04023

PRESENT SITUATION OF ALKALI WASTEWATER NEUTRALIZATION EQUIPMENT USED FOR STACK GAS DESULFURIZATION (HAIEN DATSURYUYO ARUKARI HAIEKI CHUWA SOCHI RIYO NO JISSAI NI TSUITE),
For primary bibliographic entry see Field 5D.
W76-04030

WASTE WATER PROBLEMS OF DESIZING WITH RESPECT TO LEGISLATIVE MEASURES (ABWASSERPROBLEME BEIM ENTSCHLICHTEN UNTER BERUECKSICHTIGUNG GESETZGERBERISCHER MASSNAHMEN),
For primary bibliographic entry see Field 5D.
W76-04031

ENVIRONMENTAL CONCERNS AND DECISIONS FOR THE MINING INUDSTRY,
Pennsylvania State Univ., University Park.
R. Venkataramani.
Journal of the Institution of Engineers (India), Vol. 54, No. MM2, p 45-49, March, 1974. 1 fig, 3 tab, 2 ref.

Descriptors: *Mining, *Industrial wastes, *Environmental effects, *Water pollution control, *Acid mine water, *Mine wastes, Groundwater, Engineering, Drainage, Water pollution sources.
Identifiers: Mine drainage.

The mining industry is responsible for water pollution resulting from mine drainage and the disruption of groundwater flow and normal drainage patterns. Mining and related operations cause air pollution by releasing particulate and gaseous substances to the atmosphere. Land damage from underground mining is due primarily to subsidence and ground movement. Destruction of surface topographies and soil conditions are the results of surface mining. These environmental problems often have engineering solutions. Techniques include: control at the source by prevention or reduction of acid mine drainage; treatment of polluted waters; dispersion or dilution of pollutants; and, permanent containment or isolation of polluted waters. A strong commitment is needed by the government, the mining industry, and the public to spend adequate funds for environmental protection. (Orr-FIRL)
W76-04093

CANADA WATER ACT, ANNUAL REPORT - 1974 - 1975.
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 6E.
W76-04152

CANADA CENTRE FOR INLAND WATERS - 1973.
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W76-04155

MIZUSHIMA OIL SOILL,
Environmental Protection Service, Ottawa (Ontario). Environmental Emergency Branch.
C. W. Nicol.
Information Services, Environment Canada. July 1975, 8 p, 10 photos. English and French.

Descriptors: *Oil spills, *Water pollution, Fishing, Landfills, Beaches, *Oil pollution, Research and development, Environmental effects, Equipment, Asia.
Identifiers: *Inland Sea of Japan, *Mizushima Oil Refinery, Cleanup operations, Public concern.

As an observer the author was sent to Japan, to observe cleanup measures following an oil spill in the Inland Sea of Japan, December 18, 1974. The situation was of special interest to Canada because of the similarities between the Inland Sea of Japan and Canada's Georgia Strait - Vancouver Island area. After observing cleanup operations it is concluded that research into containment, recovery and disposal of oil must continue. A brief discussion of Canadian preparations for environmental emergencies is included in the report. (Environment Canada)
W76-04159

WASTEWATER TECHNOLOGY CENTRE, CANADA CENTRE FOR INLAND WATERS, BURLINGTON, ONTARIO, ANNUAL REPORT 1974.
Environmental Protection Service, Ottawa (Ontario).
Technology Development Branch, (1975). 36 p, 17 fig, 3 tab, 27 ref.

Descriptors: *Technology, *Programs, *Projects, *Water quality control, *Water pollution control, Water quality, Sewage disposal, Sewage treatment, Research facilities, Research and development, Federal government, *Canada.
Identifiers: *Technical development programs.

Reports are presented from various sections within the Wastewater Technology Centre on their activities throughout the year 1974. The function of each station in helping to carry out water pollution control programs for industrial and municipal wastewaters across Canada is described. The major reports are from the Technology Development and Demonstration Division, the Process Development Section, the Laboratory Services Section and the Facilities Services Section. (Environment Canada)
W76-04173

SEMINAR ON FISH PROCESSING PLANT EFFLUENT TREATMENT AND GUIDELINES, 1974.
Environmental Protection Service, Ottawa (Ontario).
Economic and Technical Review Report E
WP-75-1, February 1975. 474 p, 55 fig, 109 t
ref, 3 append.

Descriptors: *Food processing industry, Fis
lutants, Wastes, Industries, Fish handling
ties, Canneries, Water pollution so
*Industrial wastes, Treatment, Eff
*Conferences, *Waste water treatment,
quality standards.

This publication contains the reports given
Seminar on Fish Processing Plant Effluent
ment and Guidelines held in Vancouver
Columbia, January 15-16, 1974, Moncton
Brunswick, April 24-25, 1974, and St.
Newfoundland, May 14-15, 1974. The semi
sponsored by Environment Canada w
cooperation of the Fisheries Association of
Columbia, the New Brunswick Fish Pack
sociation, and the Fisheries Association o
foundland and Labrador. (Environment Ca
W76-04174

IRRIGATION RETURN FLOW, A BI RAPHY.
Office of Water Research and Tech
Washington, D.C.
For primary bibliographic entry see Field 5
W76-04230

FISH PROCESSING OPERATIONS LIQ FLUENT GUIDELINES.
Environmental Protection Service,
(Ontario). Water Pollution Control Direct
Regulations, Codes and Protocols Repor
WP-75-1, June 1975, Canada Gazette, Pa
31, 1975, p 2213-2218.

Descriptors: *Waste water t
Discharge(Water), Storm water, Solid
*Canada, Measurement, *Water quality s
Identifiers: *Fish processing, Fish mea
effluents, Bloodwater, Process water,
sewage, Outfalls, Stickwater.

Requirements are presented for controll
effluent resulting from fish processing or
operations. Regulations are listed for se
drainage systems, treatment of liquid
from fish processing, offal disposal and
fluents from fish meal, sampling and
outfalls, and advanced treatment. Ex
and suggested methods of complying
requirements are included. (Environmen
W76-04240

WATER POLLUTION DIRECTORATE PUBLICATIONS.
Environmental Protection Service,
(Ontario).
June 1975. 21 p. English and French.

Descriptors: *Publications, *Bibliograp
tion abatement, Cities, Technology, Re
development, *Canada, Information ex
Identifiers: *Canada-Ontario Agreemen

Included in this list of publications
published jointly by Environmental C
the Ontario Ministry of the Environme
Canada - Ontario On Great Lakes Wa
These reports describe research proj
by the Agreement's Research Progr
Abatement of Municipal Pollution. T
are either carried out in-house by E
Canada and the Ontario Ministry of t
ment, or through contracts with mu
research institutions and industrial or
Details on ordering procedures ar
(Environment Canada)
W76-04253

EW OF CANADIAN DESIGN PRACTICE COMPARISON OF URBAN HYDROLOGIC ELS.
ren (James F.) Ltd., Willowdale (Ontario).
a-Ontario Agreement on the Great Lakes Quality, Research Report No. 26, Training echnology Transfer Division (Water), Ental Protection Services, Environment a, Ottawa, Canada, October 1975. 212 p, 48 ab, append.

tors: *Storm drains, *Drainage, Flooding, *Model studies, Hydrology, Graphical analatistical methods, Runoff, Peak discharge, raphs, Design, Methodology, Reviews, ys, *Canada, *Sewers, Cities.
ers: Questionnaires, Rational methods.

tionnaire was distributed to municipalities Canada requexting details of their storm lesign practice with emphasis on policies, s with flooding and frost conditions, and s towards new trends in urban drainage ment. Replies from 37 municipalities from ver to Halifax were received and analyzed. ban hydrologic models were evaluated. vere: 1. The Storm Water Management SWMM), 2. The University of Cincinnati (UCUR), 3. The Transport and Road h Model (RRL), 4. The Queen's Universian Runoff Model (QUURM), 5. The ray Dorsch Consult Hydrograph Volume Model (HVM). These models were evalung recorded data from 4 residential test om the United States and Canada, using to 14 different storm events on each area. racy and consistency of the models were by means of graphical and statistical son of both peak, runoff volumes and the hydrograph for the computed and hydrographs. The peak flows calculated ational Method were also compared with asured flows. All models performed rily when applied to small test areas and ls gave more consistent results than the Method. (Environment Canada)
54

CENTRE FOR INLAND WATERS,

Centre for Inland Waters, Burlington

p, 63 fig, 11 tab, 2 append.

rs: *Great Lakes, *Projects, *Programs, and development, Water quality, Intion, Engineering, Toxicity, Asbestos, ter treatment.
: *Annual reports, Hydrographic surat Lakes Water Quality Agreement, Enal assessment.

nd programs undertaken by the Canada Inland Waters, during the year 1974 are Reports of activities from the Environnagement Service, which include the Irs Directorate, the Environmental Prorvice ant the Fisheries and Marine Seresented. A major share of CCIW activiued to be directed toward the implemenrograms required by the 1972 Canada - tes Great Lakes Water Quality Agreeects outside the Great Lakes Basin were ed in areas of instrumentation developneering and suport services, environicity, and wastewater treatment. ent Canada)

RANSPORT OF WOOD: THE CURJATION,
ntal Protection Service, Ottawa Water Pollution Control Directorate.

and Technical Review Report EPS 3- ctober 1975. 72 p, 11 fig, 9 tab, 32 ref, 2

Descriptors: *Water quality, Environment, Pollutants, Environmental effects, Erosion, Fish, Recreation facilities, Fishing, Water pollution control, Costs, Pulp wastes, Jurisdiction, Governments, Pulp and paper industry, *Canada, Transportation, Lumbering.
Identifiers: *Woodfloatage, *Water transportation(Wood), Wood.

A study was made of woodfloatage in Eastern Canada in relation to the national scene. Information was obtained from people working in the logging industry, a literature review, a case study (Ottawa River). The agencies and bodies directly involved or interested in woodfloatage, and those conducting research on the environmental effects of the logging industry. A general overview of the woodfloatage situation in Canada, and a basis for the consideration of the problems associated with floating wood are presented. Recommendations are made for both immediate and long term situations. (Environment Canada)
W76-04261

OIL SPILL CONTAINING BOOM,
J. H. Neal.
US Patent No 3,921,407, 3 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 940, No 4, p 1668-1669, November 25, 1975.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution control, Floating, Buoyancy, Separation techniques.
Identifiers: *Booms, Floating booms.

A boom for containing an oil spill on a body of water is described. The boom consists of a band of longitudinally flexible, water permeable, oil-impermeable material and light weight buoyant, spaced vertical spars. The spars extend across the full width of the band are attached to it adjacent it upper and lower edges. This arrangement is found to have good vertical stability. The spars, which can each be formed of a hollow plastic pipe partially filled with foamed plastic, are light in weight and form an integral part of the boom. The boom can quickly be deployed by unreeling it directly from a storage drum. The spar is self-righting. That is, when dropped onto a body of water, it will automatically bring itself to the vertical position. This may be achieved by weighting the lower end of the spar and providing slots in the tube wall. When the spar hits the water, the weighted lower end submerges; water enters the lower end and drives the air out of the interior of the tube or casing. The weighted end functions to maintain the spar in a generally vertical position. (Sinha-OEIS)
W76-04263

SEA-WATER OIL SPILL CLEANING SYSTEM,
P. J. Strain.
US Patent No 3,922,225, 5 p, 16 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 940, No 4, p 1940, November 25, 1975.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution, *Water pollution control, Separation techniques, Ships, Pollution abatement.
Identifiers: *Oil wastes recovery, Major oil spills.

The invention consists of a funnel or collecting box and conduit conveying system in association with large pollution ships in which the sea level oil is flowed by gravity or else suction-pumped from the sea with as little water as possible in a first separating step and then further separated in a second separating step by flow straight through a main separation tube extending from bow to stern and amidship with baffling means to direct oil off to starboard and port into oil separation tanks. If it is not desired to fill the tanks of the control ship of if they are already filled or if such tanks are not provided the baffled flow-through system can be utilized to by-pass separated oil to waiting tankers. It is expected that a ship suitably equipped may be capable of cleaning the sea after a major oil spill of crude, bunker C or diesel oil at the rate of at least 1,000 tons per hour as against present methods which deal with approximately 30 tons per hour. In such a cleaning operation means may be provided whereby the oil spill may be contained or fenced in. Thus oil may be pushed and accumulated in the aarea of the oil-removing or control ship. (Sinha-OEIS)
W76-04271

FLOATING BOOM HAVING ROTATABLE FLOAT ELEMENTS,
Pacific Pollution Control, Inc., Emeryville, Calif. (Assignee)
N. D. Tanksley.
US Patent No 3,922,860, 6 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 60, December 2, 1975.

Descriptors: *Patents, *Oil pollution, Water pollution, *Water pollution control, Water quality control, Barriers, Floating, Pollution abatement.
Identifiers: Floating booms, Containment, Deployment.

The floating boom includes an elongated partition and a number of float means mounted to the partition at periodic intervals over the length. Each float means includes a pair of float elements placed on either side of the partition. The float elements are rotatably mounted to the float for rotational movement to and from a deployed position and a relatively rotated stored position. The float elements are formed to enable a reduction in the overall bulk of the boom when the float elements are in the stored position. The float elements are mounted to the remainder of the float in a manner causing the combination buoyancy and gravity forces to bias the float elements to the deployed position. The partition is formed as a flexible member and the float means are mounted to the partition for flexure of the partition. In the stored position the flexible elongated sheet-like partition is folded back and forth upon itself and the float means are positioned between the folds of the partition and the rotable plate-like float elements are rotated on the float means parallel to and between adjacent folds of the partition. A retainer holds the boom in the folded position and is released to deploy the boom. The partition is pulled in a direction along its length to distend the folds of the partition and free the float elements for rotation to the deployed position. (Sinha-OEIS)
W76-04272

FLOATING MARINE BARRAGE,
A. Grihangne.
US Patent No 3,922,861, 4 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 61, December 2, 1975.

Descriptors: *Patents, *Oil pollution, Oil spills, Water pollution, *Water pollution control, Water quality control, Barriers, Floating, Buoyancy, Pollution abatement.
Identifiers: Inflation(Air), Containment.

A floating marine barrage of adjustable draught is comprised of a single, ballasted, flexible tube having a cross-section which assumes the shape of an inverted tear drop when inflated. The tube has an upper buoyance compartment and a narrower ballasted lower end and at least one air inlet at one of the ends. The amount of air blown into the tube allows its immersion to be adjusted. The production is economical as it is manufactured from a single web of airtight flexible material closed edge to edge on itself. It can be stored by winding it on a horizontal drum. The tear drop equilibrium shape assumed by the air tube depends both on the amount of air blown into the barrage and the linear density of the ballast secured to the lower edge. The user has the possibility of regulating the height of the emergent portion of the barrage and consequently its draught thereby enabling optimum adjustment depending upon the state of the water

level and the intensity of the wind. The barrage is equipped with metallic ballast plates which are regularly spaced and positioned in sandwich formation at the joint of the two edges of the flexible sheet. (Sinha-OEIS)
W76-04273

FLOATING CONTAINING VESSLES OR DAMS FOR TRAPPING LIQUID POLLUTANTS,
J. Vidilles.
US Patent No 3,922,862, 4 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 61, December 2, 1975.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution control, Liquid wastes, Barriers, Floating, Separation techniques, Pollution abatement.
Identifiers: Floating barriers, Containment, Towing.

A floating containing vessel is provided for confining slicks of liquid pollutants. The vessel or dam comprises a flexible skirt connected at its upper portion to a float which provides vuoyancy to the vessel, and at its lower portion to a ballast. The skirt forms an enclosure wherein the pollutants collect and the depth of the skirt varies from a maximum at the maximum interior position of the enclosure to a minimum at the towing ends of the vessel which define the entrance to the enclosure. The ballast is utilized as a towing means for towing the containing vessel or dam. (Sinha-OEIS)
W76-04274

OIL SKIMMER WITH LEAD FLOAT AND HINGED WEIR,
A. J. Crisafulli.
U.S. Patent No 3,923,661, 4 p, 4 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 941, No 1, p 317-318, December 2, 1975.

Descriptors: *Patents, *Oil pollution, *Water pollution, *Water quality control, Skimming, Oil spills, Weirs, Overflow, Waves(Water), Water pollution control, Separation techniques.

A two-part skimming device for removing a layer of oil or other floating pollutants from the surface of a body of water is relatively small so that it can be transported easily. One part is a generally U-shaped flotation or pontoon unit. The other part is a combined collecting and pumping unit and has a hinged mounted weir plate and lead float to control the position of the weir in relation to the surface of the water. An adjustable mounting for the collecting and pumping unit includes pockets in the flotation unit receiving threaded bolt members which in turn are received in threaded apertures in part of the supporting structure for the weir plate. This aids in varying, in gradual steps, the vertical position of the weir. The lead float is connected to the hinged weir plate and provides 'fine' adjustment to variations in wave height. A self-contained power unit is provided to operate the pump and associated discharge structure, and connecting and conduit means effectively contain the gathered pollutants. (Sinha-OEIS)
W76-04284

IGNITION AND COMBUSTION IN SITU OF OIL FROM WRECKED OIL TANKERS: SMALL SCALE BURNING TESTS CARRIED OUT AT THE RPE,
Rocket Propulsion Establishment, Wescott (England).
J. Diederichsen, A. R. Hall, and P. T. Hinde.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 988, $4.00 in paper copy, $2.25 in microfiche. Technical Memorandum No 616, July 1972. 45 p, 11 fig, 4 tab, 11 ref, 7 append.

Descriptors: *Oil spills, *Ships, *Burning, *Oil pollution, Water pollution, Water pollution control, Laboratory tests, Winds, Waste disposal.
Identifiers: *Oil tankers, Tanks, Tanker accidents, Burning tests, Burning rates.

The effect of the size and position of venting apertures on the burning rate of crude oil in model tanks has been determined. One side aperture and one lid aperture were used in all tests, only their size and relative positions being changed. The effect of wind speed on the burning rate was also investigated, burnings being performed in still air and in blower-generated winds of about 6 and 11 m/s. Tanks of three different sizes were used, the largest being 1 sq m plan cross-sectional area, in an attempt to predict from the burning rates found in small scale tests those to be expected in a much larger tank. The tanks were water cooled on the bottom and on one side to simulate conditions at sea. Some empirical extrapolations and scaling rules have been obtained which provide an estimate of the probable burning rate in ship-sized tanks under various conditions of wind and venting. (Sims-ISWS)
W76-04312

A DISPERSION CURVE STUDY OF MODEL DREDGE SPOIL BASINS,
Texas A and M Univ., College Station. Dept. of Civil Engineering; and Texas A and M Univ., College Station. Coastal and Ocean Engineering Div.
For primary bibliographic entry see Field 5B.
W76-04321

THE PROTECTION OF THE ENVIRONMENT AND WORLD PUBLIC ORDER: SOME RECENT DEVELOPMENTS,
Yale Univ., New Haven, Conn. School of Law.
For primary bibliographic entry see Field 6G.
W76-04329

SYSTEMS DESCRIPTION OF THE U.S. COAST GUARD MARITIME ENVIRONMENTAL PROTECTION PROGRAM,
G. P. Wright, and D. G. Olson.
In: Designing Water Pollution Detection Systems, p 1-31, Ballinger Publishing Co., Cambridge, Mass., 1974. 31 p, 6 fig, 3 tab, 4 ref.

Descriptors: *Oil spills, Ships, *Inter-agency cooperation, *Pollution abatement, Administrative agencies, Comprehensive planning, Coordination, International waters, Navigable waters, Harbors, Ultraviolet radiation, Infrared radiation, Temperature, Costs, Coast Guard regulations, Oily water, Oil wastes, Oil pollution, Management, Standards, Water management(Applied), Federal government, Jurisdiction, Adoption of practices, Water pollution control.
Identifiers: *National Oil and Hazardous Substance Pollution Contingency Plan, Detection(Pollution), *National Response Team, Water Quality Improvement Act of 1970, Environmental Protection Agency, Oil Pollution Act of 1961, Federal Water Pollution Control Act Amendments of 1972, Milford Haven.

The United States Coast Guard is one of a number of federal agencies and departments that have been created to deal with the growing problem of oil--and other hazardous substances--polluting American ports, waterways, and the high seas. In this capacity, the Coast Guard has four main objectives: (1) enforcement of antipollution laws; (2) regulation of equipment and procedures to prevent pollution from ships; (3) development of response capabilities to minimize pollution once a spill occurs; and (4) establishment of a surveillance system utilizing the latest in pollution detection techniques. As an example of recent efforts, this article examines Coast Guard use of planes equipped with ultraviolet and infrared sensors. Since oil pollution at sea is often wilfull, as opposed to in port where it is usually accidental, such remote techniques are increasingly important to pollution enforcement. The Coast Guard's role as a member of the National Response Team created as part of the National Contingency Plan examined. The team serves as the b planning and preparedness prior to a p spill, and as a co-ordinator and advisor w tivated. (Parrish-Florida)
W76-04330

A SURVEY OF REMEDIES (TO WATE LUTION AND WATER SCA PROBLEMS).
Stanford Environmental Law Society, Cali
In: Interstate Environmental Problems, p Stanford Law School, Standford, Calif., (p, 171 ref.

Descriptors: *Remedies, *Water control *Abatement, *Surface waters, California health, National Water Commission, C Costs, Rivers and Harbors Act, Eminent Federal government, State governments, trative agencies, Interstate compacts, I commissions, Rivers, Basins, Tennesse Authority, Legal aspects, Standards, W ing, US Water Resources Council.
Identifiers: *Tahoe-Truckee Sanitatio cy(TTSA), *Citizen suits, *Fish and Gam ment, *Federal Water Pollution Act(FWPCA), Amendments of 1972, Re of 1899, Water boards, National Envir Policy Act of 1969(NEPA), Environment Act, Nuisance actions.

Citizens with water-related problems ha broad spectrum of administrative, jud political remedies from which to choose. forcement agencies, such as Fish and partments and Public Health Dep generally offer the quickest relief. Some however, because of their complex natur the citizen to look either to state or fed cies. A number of states have taken adv the 1972 Amendments to the Federal W tion Control Act which allows them to their own waste discharge permit system involvement in water control also includ vironmental Protection Agency (EPA), cil of Environmental Quality (CEQ), Corps of Engineers, and the Water Council. Sometimes the role of the feder ment is one of an ally to the environ sometimes it is one of indifference, and that role is the very cause of the envi problem. Concerned citizens can also bringing civil or even criminal actions luters under the various state and federa acts. (Parrish-Florida)
W76-04331

COMPENSATION FOR OIL PO DAMAGE RESULTING FROM EXPL AND EXPLOITATION OF HYDROCA THE SEABED,
Compagnie Francaise des Petroles, Par Dept. of Law.
For primary bibliographic entry see Fie
W76-04333

WATER POLLUTION CONTROL IN THE ALASKA ENVIRONMENTAL C TION ACT OF 1971,
Tennessee Univ. at Nashville.
L. L. Laska, and G. C. Fant.
UCLA - Alaska Law Rev., Vol 4, No (1975). 31 p, 164 ref, 1 append.

Descriptors: *Law enforcement, *Legislation, *Water pollution *Conservation, Legal aspects, Stand government, Penalties(Legal), Jurisdi jurisdiction, Regulation, Natural resou resources, Water law, Water pollution lution effects, Water pollution Economics, Economic impact, Soc Water quality, Water quality stand quality control, Pollutants.

tifiers: *Alaska Environmental Conservation of 1971, Environmental policy, Administrative lations, Injunctive relief.

Alaska Environmental Conservation Act of broadly defines protected waters and actiona- ollution, giving the Department of Environ- al Conservation extensive pollution control rs. The Department's power includes ju- tion over municipalities as well as private ters. Through its statutory provisions, the De- ent has generated classification standards h require the maintenance of existing condi- where they are superior to specific legally lished standards unless it can be demon- d that a change is justifiable and that such e will not preclude present and anticipated f water. The regulations also require the t degree of practicable treatment of all arges. The Act contains what are regarded as prohibition and penalty provisions and sents a comprehensive pollution control pro- far superior to most current state programs. ey-Florida)
4340

A PRINCIPLES OF WATER RESOURCES CY (POLICY STATEMENT OF AMER- WATER WORKS ASSOCIATION).
ican Water Works Association, Denver,

can Water Works Association Journal, Vol 8, p A20-A22, August, 1975. 3 p.

iptors: *Governmental interrelations, r resources development, *Water works, dination, *Water quality control, Legal s, Water law, Governments, State govern- Federal governments, Local governments, resources, Potable water, Water pollution s, Water pollution effects, Water pollution ent, Water quality, Utilities, Public health, utilization, Environmental effects, mic impact, Social impact, Ecosystems.

olicy statement, representing the official int of the American Water Works Associa- WWA), is based on two premises: that the y objective of water resource policy should maintenance of an adequate supply of high water; and that the responsibility for water e projects should rest with private interests ion of government closest to the people ed. A number of corollaries stem from remises, including the idea that priorities er source development should be assigned asis of the possible contribution the souce ake to the social and economic welfare of ion, and the effects it could have on re- ydrology and ecology. Responsibility for n control should rest with those who return products to the waters. The role of the government should be to support and te with local efforts, rather than to them. The major role, however, in ing, controlling and policing water es the AWWA would assign to the states, ingle agency established in each state to comprehensive coordinated policies and s. (Nursey-Florida)
342

LIFORNIA COASTAL ZONE CONSER- ACT OF 1972 (PROPOSITION 20) AND RABLE LAND USE LIMITATIONS AF- G THE MINERAL INDUSTRY IN STATES,
Petroleum Co., Forth Worth, Tex.
ary bibliographic entry see Field 6E.
45

E INFLUENCE ON ENVIRONMENTAL : THE CASE OF THE NATIONAL IN- AL POLLUTION CONTROL COUNCIL,
iv. of New York Coll. at Cortland. Dept. al Science.

For primary bibliographic entry see Field 6G.
W76-04346

INTERNATIONAL LAW AND NUCLEAR TEST EXPLOSIONS ON THE HIGH SEAS,
New York Univ., N.Y. Center for International Studies.
For primary bibliographic entry see Field 6E.
W76-04350

POTENTIAL HEALTH HAZARDS AND THE BURDEN OF PROOF IN ENVIRONMENTAL ACTIONS: THE IMPLICATIONS OF RESERVE MINING.
For primary bibliographic entry see Field 6E.
W76-04351

SALTING THE EARTH,
Worldwatch Inst., Washington, D.C.
For primary bibliographic entry see Field 3C.
W76-04352

THE NEEDS FOR WATER QUALITY MODELS ON AGRICULTURAL WATERSHEDS,
Southeast Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5B.
W76-04353

NATIONAL SAFE DRINKING WATER STRATEGY -- ONE STEP AT A TIME.
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-04354

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION ACT.
Alaska State Dept. of Environmental Conservation, Juneau.
In: 1973 BNA Environmental Rep. 706:0101-05 (Alas. Laws 1971, as amended 1972). 5 p.

Descriptors: *Penalties(Legal), *Alaska, *Water pollution control, *Water quality standards, *Permits, *Environmental control, Water pollution, Water quality, Legislation, Regulation, Legal aspects, Sewage disposal, Oil pollution, Oil wastes, Damages, Water conservation, Water resources, Hazards.
Identifiers: Hazardous substances, Absolute liability, Administrative regulations, Injunctive relief.

The Alaska Department of Environmental Conservation has jurisdiction to prevent and abate the pollution of the waters of the state. The department shall establish: (1) water pollution control plans; (2) pollution standards; (3) quality and purity standards; (4) plans for pollution disposal; and (5) waste disposal permits and permit procedures. The statute prohibits unauthorized discharges of sewage, oil or petroleum products, and vessel ballast water when pollution may result. Any such violations may result in the imposition of fines and/or imprisonment. Any vessel in violation of the statute may be detained and searched by an authorized officer. Furthermore, a person whose violation of the statute results in the death of fish, animals or vegetation, or injures the environment in other ways, shall be liable to the state for damages. Finally, a person having control over a hazardous substance which enters in or upon the waters of the state shall likewise be held strictly liable for damages to persons or property caused by such a discharge. The department is further authorized to seek search warrants to investigate suspected sources of pollution. (Welch-Florida)
W76-04365

ALASKA WATER QUALITY STANDARDS.
In: 1973 BNA Environmental Rep. 706:0501-05 (Alas. Ad. Code (AAC)). Title 18, Environ. Conserv., Ch 70, 1972). 5 p, 1 tab.

Descriptors: *Classification, *Alaska, *Water pollution control, *Legislation, *Water quality standards, Water quality control, Water pollution, Water pollution treatment, Water quality, Legal aspects, Administration, Administrative agencies, Administrative decisions, Environmental control, Water resources, Water law, Quality control, Public health, Sewege treatment.
Identifiers: *Water use classifications.

The water quality standards herein for the state of Alaska shall apply to all waters of the states. Seven water use classifications are designated along eith water quality criteria applicable to each. In determinaing the appropriate water quality criteria for any waters, the Department of Environmental Conservation shall consider the following: (1) if the waters have more than one classification, then the most stringent water quality criteria shall apply; and (2) if a tributary water receives sewage waste disposal, then the most stringent water criteria applicable to either the tributary water or the confluence water shall apply to the tributary water. Secondary treatment is required for all sewage and industrial wastes unless studies approved by the department and the Environmental Protection Agency show that the water quality standards can be met by primary treatment. Any application to the department for a certificate showing a proposed activity of the applicant will not violate applicable water quality standards shall be subjected to public hearings. Any violation of these standards or regulations may result in either fines or imprisonment or both. (Welch-Florida)
W76-04366

ARIZONA WATER POLLUTION CONTROL LAW.
Arizona State Dept. of Health, Phoenix. Environmental Health Service.
In: 1973 BNA Environmental Rep. 711:0101-06 (Ariz. Rev. Stats. Title 36, Water Pol. Contr., Ch. 16, 1967, as amended 1971). 6 p.

Descriptors: *Arizona, *Water pollution control, *Legislation, *Water pollution treatment, *Waste water disposal, Water permits, Water pollution, Water quality, Water quality control, Water quality standards, Legal aspects, Pollution abatement, Federal Water Pollution Control Act, State Governments, Administration, Administrative agencies, Administrative decisions, Sewerage, Water.
Identifiers: *Administrative regulations.

The Arizona Department of Health and Arizona Water Quality Control Council shall adopt and amend reasonable standards of quality for the waters of the state for the prevention and abatement pollution. No single standard has been set up, but the council shall have power to set up a variable standard which relates to the amount or degree of pollutants that are permitted to be discharged into the state's waters following criteria established by the Federal Water Pollution Control Act, and other variables related to public health and to the extent of pollution resulting from different activities. The statute prohibits any discharge or location of wastes which would be likely to result in pollution of any state water, including those within Indian tribal reservations. The Department of Health requires the submission of a permit for any construction or extension of any disposal or treatment system. The statute further provides for injunctive relief to prevent or halt any acts or practices which are in violation of the statute. (Welch-Florida)
W76-04367

ARIZONA RULES AND REGULATIONS FOR SEWERAGE SYSTEMS AND WASTE TREATMENT WORKS.
Arizona State Dept. of Health, Phoenix.
In: 1971 BNA Environmental Rep. 711:0501-03 (Ariz. Rules and Regs. Dept. Health). 3 p.

Descriptors: *Arizona, *Sewage treatment, *Sewerage, *Waste water treatment, *Waste water(Pollution), Waste disposal, Waste water disposal, Wastes, Water pollution, Regulation, Administrative agencies, Water pollution control, Water pollution treatment, Water quality, Environmental control, Environmental sanitation, Treatment facilities, State governments, Administration, Industrial wastes.
Identifiers: *Administrative regulations.

The Arizona Department of Health has prescribed the rules and regulations applicable to any sewage or industrial waste disposal made into any of the waters or lands of the state. No discharges are permitted that are determined by the department to be detrimental to the quality of the receiving body of water or land, or which are prejudicial to the health of persons who may be affected by the resulting environmental condition. The use of cesspools is prohibited and septic tanks must meet quality criteria before they can be used. Any construction or extension of sewerage systems must be approved by the department after an application sets out sufficient planning and engineering specifications. All such waste treatment works must equal or exceed the design criteria specified by state regulation. All such completed treatment works are subject to inspection by designated department representatives; and works officers shall be notified of any unsatisfactory conditions along with recommendations for correction. The rules further regulate any pollution risks which might occur because of sewers and nearby water lines. (Welch-Florida)
W76-04368

CALIFORNIA WATER POLLUTION CONTROL LAWS.
California State Water Resources Control Board, Sacramento.
In: 1973 BNA Environmental Rep. 721:0101-27 (Calif. Water Code). 27 p.

Descriptors: *Permits, *California, *Water pollution control, *Legislation, *Water quality control, Water quality standards, Regulation, Water pollution treatment, Waste water disposal, Water pollution, Legal aspects, Pollution abatement, Federal Water Pollution Control Act, Sewage, Administrative decisions, Sewage treatment, Waste disposal, Water quality, Water treatment.
Identifiers: Administrative regulations, *Clean Water Bond Law(Calif), Injunctive relief.

The state of California has organized a State Water Quality Control Board which, along with Regional Water Quality Control Boards, shall formulate state policy for water quality control. Activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest reasonable water quality. Whenever a regional board finds that discharge is taking or is going to take place in violation of state water quality standards, the board may, to prevent such violation, use: (1) administrative remedies by regional and state boards; (2) judicial review and enforcement; (3) summary judicial abatement; and (4) civil monetary remedies. Provisions for compliance with the Federal Water Pollution Control Act as amended in 1972 are accepted, and a fund established providing state assistance to public agencies to aid construction of waste treatment facilities and facilities to reclaim waste water and to convey reclaimed water. The board also seeks to encourage use of reclaimed water to aid in the development of a new basic water supply. Finally the statute provides for: (1) special water quality standards; (2) the Clean Water Bond Law of 1970; and (3) regulation of transportation and disposal of liquid waste. (Welch-Florida)
W76-04369

REQUIREMENTS AND RESPONSIBILITIES OF THE STATE WATER RESOURCES CONTROL (REGULATIONS FOR IMPLEMENTATION OF THE ENVIRONMENTAL QUALITY ACT OF 1970).
California State Water Resources Control Board, Sacramento.
In: 1974 BNA Environmental Rep. 721:0536-44 (Calif. Public Resources Code Section 21082).

Descriptors: *California, *Environmental effects, *Federal Water Pollution Control Act, *Decision-making, *Water quality control, Environmental control, Administrative agencies, Administration, Legal review, Legislation, Water resources development, Adoption of practices, Administrative decisions, State governments, Water quality standards, Regulation.
Identifiers: *Environmental impact report.

In order to assure the orderly implementation of the state Environmental Quality Control Act of 1970 (CEQA), California has promulgated regulations prescribing the procedures to be followed by state and regional boards authorized to implement the Act. The major source of information for board decision-making will be the environmental impact report (EIR), which will set forth detailed statements concerning the environmental impact of any proposed project. When evaluating an EIR, agency boards are directed to give major consideration to the environmental damage a project may cause. Other specified activities may be initiated by the state or local boards without the preparation of an EIR. As to EIR's actually submitted, procedural requirements are set forth concerning their review. These regulations also set forth the procedures to be followed in implementing Section 208 of the Federal Water Pollution Control Act (FWPCA). Under this section, areas having substantial water quality problems must be identified and designated by the state governor. The regulations further prescribe the duties of the governor to the state board, and provide a detailed list of the criteria to be considered by the board in determining and designating Section 208 areas. (Hoffman-Florida)
W76-04370

COLORADO WATER QUALITY CONTROL ACT.
Colorado Dept. of Health, Denver.
In: 1974 BNA Environmental Rep. 726:0101-12 (Colo. Rev. Stats. 1963, Amended by S. 86 and S. 91, 1974). 12 p.

Descriptors: *Colorado, *Water pollution control, *Water quality control, *Water quality standards, *Classification, Effluents, Discharge(Water), Waste water(Pollution), Law enforcement, Permits, Regulation, Monitoring, Control systems, Data collection, Penalties, (Legal), Non-structural alternatives, Water pollution.
Identifiers: *Public hearings.

Recognizing that the pollution of state waters constitutes a public menace, Colorado has created the Water Quality Control Commission for the purpose of developing comprehensive programs for the prevention and control of water pollution. To aid in the development of such programs, the Commission shall: (1) classify state waters; (2) promulgate water quality standards and regulations; (3) set up a permit system for regulating effluent discharges; and (4) perform other specified duties. The Water Quality Control Act also sets up procedures designed to assure the enforcement of programs instituted by the Commission. The division given enforcement authority shall be responsible for assuring that owners or operators of effluent discharging facilities monitor, record and report all information needed to assure compliance with the Act. Because any regulations or actions taken by the Commission will have a pervasive impact on many individuals, the Act requ procedural requirements pertaining to notice public hearings be followed before any ac becomes final. Appropriate civil and crim penalties are provided to help insure compli with all provisions of the Act. (Hoffman-Florid W76-04371

COLORADO REGULATIONS FOR THE ST DISCHARGE PERMIT SYSTEM.
Colorado Water Quality Control Commis Denver.
In: 1975 BNA Environmental Rep. 726:05 (Colo. Water Qual. Control Regs. 1975). 9 p, pend.

Descriptors: *Control, *Federal Water Poll Control Act, *Water quality control, *Monito *Permits, Administration, Decision making, ministrative agencies, Discharge(W Discharge measurement, Legislation, Regul Legal aspects, State governments, water(Pollution).
Identifiers: Permit systems, Public notice hearings, *Colorado Water Quality Act.

In conformity with the Federal Water Poll Control Act Amendments of 1972, these r tions will aids in the implementation o Colorado Water Quality Control Act. Althou regulation provide for certain statutory e tions, they generally require that a permit tained before any pollutant is discharged int waters. Procedures that must be followed in ing for a permit are presented, along wi criteria that must be considered by the authorized to issue the permit. If a per granted, it shall not be for a period to exce years, and it shall be subject to certain p tions and conditions stipulated in the Act. sure that the conditions of the permit are fol the appropriate issuing agency is authori monitor the discharge activities of the holder. Because of the public interest in suance of permits, prescribed public notic be satisfied before a permit will be gran cases where a total volume of discharge e 500,000 gallons daily, prescribed fact shee be prepared by the agency and made avail the public. Finally, the Act sets forth qu tions for individuals who desire to be a me the Water Quality Control Commission, th cy authorized to implement the Water Control Act. (Hoffman-Florida)
W76-04372

COLORADO WATER QUALITY STAND
Colorado Water Quality Control Com Denver.
In: 1974 BNA Environmental Rep 726: (Colo. Water Qual. Control Comm'n Wat Stand) 26 p, 12 tab, 2 append.

Descriptors: *Colorado, *Classification, quality standards, *Water types, *Water control, Recreation, Water properties, management, Bodies of water, A techniques, Flow profiles, Effluents, M wastes, Regulation, State jurisdiction aspects, Industrial wastes.
Identifiers: Antidegradation, *Water cl tion.

In order to reach the goals of the Water Control Act of 1973, the Water Quality Commission has promulgated standards as the basis for the classification of stat Several basic standards are presented w applicable to all state waters. These generally require that the waters be f floating debris and from substances attrib municipal or industrail discharges. The also provide that waters be classified as A2, B1, B2, Class A waters are those tha for all purposes for which raw water is used, including primary contact recreatio

ıming. Class B waters are those that may not sed for primary contact recreation, although may be used for other class A purposes. To ı the classification of waters, these standards ain the requirements for several different cts of classification including: zone of ge; flow criteria and exceptions; analytical g; antidegradation statement; and the degree eatment. Finally, an appendix is presented h contains a list of all waters in the State of rado and their classification. (Hoffman-da)
04373

ORADO STANDARDS FOR THE HARGE OF WASTES.
ado Water Pollution Control Commission, er.
974 BNA Environmental Rep 726: 1101-03 Water Pollution Control Comm'n Standards e Discharge of Wastes, 1973).

iptors: *Colorado, *Water quality standards, tewater disposal, Analytical techniques, pling, Water quality control, Legislation, jurisdication, Oil, Chlorine, Hydrogen ion ntration, Suspended solids, Turbidity, Water rties, Impaired water quality, Water pollu-ffects, Adoption of practices.
fiers: *Fecal count limits.

hance the quality of water within the state, lorado Water Pollution Control Commission promulgated standards to control the rge of water. Apart from a few statutory ex-ns, the water quality standards are applica-all waste water discharges into state waters. technical standards, which are presented in concern such waste water factors as: settle-lids; suspended solids; turbidity; pH limits; coliform counts; dissolved oxygen limits; al chlorine limits; and oil and grease limits. andards provide that the American Public Association's Standard Methods for the nation of Water and Wastewater shall be the ling reference when devising tests and cai procedures to measure compliance with vater stnadards. Finally the standards pro-at the analysis of wastewater discharges e based on six hour composite samples. an-Florida)
374

II ENVIRONMENTAL QUALITY LAW.
State Office of Environment Quality Con-nolulu.
4 BNA Environmental Rep. 756: 0101-02 nviorn. Laws and Regs., Vol. 1, Title 19, Ch. 342, Environ. Qual. Part III; as d by Laws 1973 Ch. 118). 2 p.

tors: *Hawaii, *Water quality control, nts, *Permits, *Pollution abarement, h and development, Waste ollution), Control systems, Monitoring, uctural alternatives, Penalties(Legal), Law ment, Water quality standards, Equip-Water pollution, Water pollution control, ge(Water).
rs: Water pollution control equipment, ystems.

fort to improve the environmental quality ii, the administrator of the state Office of nmental Quality Control has the power to cified steps to prevent, control, or abate ollution. Under the authority of this he administrator may: (1) establish water standards and regulations; (2) initiate programs for the purpose of analyzing es and effects of water pollution; (3) dis-ducational information to the public con-various aspects of water pollution; (4) permit and instpection system for pollu-rol equipment; and (5) require detailed in-n from the operator or owner of any source of effluent discharge. The statute also gives the administrator the authority to make grants, appropriated by the legislature, to local governmental units for the purpose of constructiong or improving sewage treatment works. No local agency may apply for these grants, however, unless they meet the specified requirements. Finally, the statute described who is eligible to be a member of the state Environmental Quality Control Board. (Hoffman-Florida)
W76-04376

KANSAS UNDERGROUND STORAGE REGULATIONS.
Kansas State Board of Health, Topeka.
In: 1973 BNA Environmental Rep. 781:0541 (Kansas Stat., Ch. 28, State Health Regs., Art. 13, secs. 28-13-1 thru 28-13-11 1966).

Descriptors: *Underground storage, *Kansas, *Discharge(Water), *Industrial wastes, *Storage requirements, Storage, Reservoir storage, Water management(Applied), Water supply, Underground storage, Waste storage, Storage capacity, Water wells, Subsurface waters, Riddance(Legal aspects), Surface waters, Administrative agencies, Storage tanks, Standards.
Identifiers: *Administrative regulations.

The Kansas State Board of Health herein regulates the construction and use of underground storage reservoirs, disposable water and surface ponds for the confinement, storage and disposal of industrial fluid other than those resulting from oil field activities. Plans and specifications for storage of fluid or gaseous products in underground reservoirs must be submitted to the Board for approval prior to construction or development. Any operator of such an underground reservoir must maintain a permanent record of the type and quantity of all products stored therein. The storage or disposal of wastewater in any surface pond or disposal well must also be approved by the Board and upon abandoment of the pond the operator must dispose of any such wastewater in a manner acceptable to the Kansas State Dept. of Health. All applicants must supply any information, plans or specifications that may be needed by the Board to adequately review the project.
W76-04377

KANSAS WATER POLLUTION CONTROL LAWS.
Kansas State Board of Health, Topeka. Div. of Enviornmental Health.
1975 BNA Environmental Rep. 781: 0101-09 (Kan. Stat. Ann. Sections 65-161 thru 65-171 as amended 1974) 9 p.

Descriptors: *Kansas, *Permits, *Water pollution control , *Legislation, *Water quality control, *Water quality, Water quality standards, Waste water treatment, Sewage, Sewage treatment, Sewage disposal, Administrative agencies, Discharge(Water), Regulation, State governments, Legal aspects, Control, Control systems, Penalties(Legal), Standards.
Identifiers: *Mercury pollution.

The Kansas State Departmet of Health and Environment herein sets forth the Water Pollution Control Laws of that state. The Act requires the Department encompass within its rules and powers a broad range of investigatory and regulatory duties, including: (1) regulation of sewage plants, and investigation of complaints therein; (2) issuance of discharge permits; (3) scheduling of fees to defray costs of administering the water pollution control permit system; (4) administration of penalties to sewage plants for discharges without a permit or for failure to comply with Department requirements; and administration of rules and regulations to protect state waters from pollution by oil and gas storage reservoirs and from mercury discharges. The Act further provides that reasonable access to facilities subject to this act be made available to any authorized representative of the Department and that strict standards concerning oil and gas be followed. including regulation of possible pollution, drilling and disposal. The Act provides for criminal prosecution and for payment of fines by those found in violation of the Act. (Welch-Florida)
W76-04378

KANSAS WATER QUALITY CRITERIA.
1974 BNA Environmental Rep 781:0501-04 (Kan Stat Ann secs. 65-165 thru 65-171 (d) 1973) as amended 1973. 4 p, 1 map, 1 chart.

Descriptors: *Water quality standards, *Kansas, *Classification, *Water quality, *Surface waters, Administrative decisions, Beneficial use, Swimming, Recreation, Waterfowl, Wildlife, Agriculture, Fishing, Boating, Streamflow, Reservoirs, Lakes, Aquatic life, Surface runoff, Bacteria, Dissolved oxygen, Temperature, Ammonia, Waste disposal, Turbidity.

Kansas has promulgated water quality criteria for all surface waters of the state. Representative provisions include: (1) water uses shall be grouped into Class A waters and Class B waters; (2) water treatment and control of municipal and industrial wastes shall be used to reduce organic load, oil, grease, solids, alkali, acids, toxic materials, color and turbidity, taste and odor products, and other deleterious materials to the lowest practicable level; (3) flow criteria are established to determine when water quality criteria shall apply; (4) zones of passage of continuous water routes of the volume, area, and quality necessary to allow passage of free-swimming and drifting organisms without significant effects on their populations must be provided in streams, reservoirs and lakes whereever mixing zones are allowed; and (5) all watercourses which reach zero natural flow annually are exempted from water use classification and the application of water quality criteria except certain specified watercourses and those that can be expected to support acquatic wildlife. Finally, specific criteria are set forth for controlling bacteria, dissolved oxygen content, temperature, pH factor, ammonia, oil and grease, solids, turbidity, taste and odor producing substances, color, and toxic substances. (Segall-Florida)
W76-04379

MICHIGAN LIQUID INDUSTRIAL WASTE DISPOSAL ACT.
In: 1972 BNA Environmental Rep. 811:0121-22 (Act 136, Mich. Pub. Acts of 1969). 2 p.

Descriptors: *Transportation, *Michigan, *Waste disposal, *Liquid wastes, *Industrial wastes, Wastes, Investigation, Inspections, Oil, Soil stabilization, Drains, Ponds, Streams, Surface waters, Groundwater, Water pollution, Jurisdiction.
Identifiers: Surety bond.

In Michigan, before engaging in the business of removing liquid industrial wastes from the premisis of another, a person shall obtain a license from the state water resources commission. A license fee of $100 and a surety bond of $15,000 for residents of the state and $30,000 for non-residents must accompany a license application. If the commission is satisfied that the applicant has the qualifications, experience, reputation and equipment to perform the services in a manner not detrimental to the public interest, it then issues a license to the applicant. All trucks or other vehicles used to transport or carry liquid industrial wastes must carry a license from the commission verifying inspection by a commission representative or law enforcement agent. The tank must be kept tightly closed in transit to prevent the escape of contents and odors. Finally, the licensee must keep records of all trips where pickup, hauling, or disposal of wastes are involved and must not dispose of wastes onto or into the ground except at

locations specifically approved by the commission. (Segally Florida)
W76-04380

MICHIGAN OIL SPILLAGE REGULATIONS.
In: 1973 BNA Environmental Rep 811:0621-23 (Mich Ad Code Part 5, 1973). 3 p.

Descriptors: *Michigan, Structural design, Check structures, *Oil pollution, *Oil spills, *Water pollution control, Legal aspects, Water law, State governments, Legislation, Oil industry, Water pollution, Water pollution sources, Pollutants, Water quality, Water quality control, Engineering structures, Salts, Equipment.
Identifiers: Administrative regulations, Booms.

Michigan has enacted regulations which require that, before oil is on-loaded or off-loaded through a conduit to or from a vessel on waters of the state at an oil storage facility, booms and associated equipment must be available at the site to prevent the spread of spilled oil. Similarly, an oil storage facility adjacent to a watercourse must have such equipment available. During the on-loading or off-loading of oil at such facilities, adequate surveillance of the loading operation shall be maintained so that any oil spillage can be immediately detected. Furthermore, a storage or use area at an oil storage facility must be structurally enclosed so that no oil can escape through sewers, drains, or otherwise to surface or ground waters. Similar structural enclosures must be constructed at any on-land facility in which salt in liquid form is stored. Finally, any on-land facility used for the storage of polluting material must be structurally enclosed pursuant to these regulations. (Nursey-Florida)
W76-04381

MICHIGAN CLEANING AGENTS REGULATIONS.
In: 1973 BNA Environmental Rep 811:0661-62 (Mich Ad Code Part 6, 1972). 2 p.

Descriptors: *Michigan, *Administrative agencies, *Regulation, *Chemical wastes, *Water pollution control, Water law, Legal aspects, State governments, Legislation, Detergents, Water pollution, Water pollution sources, Pollutants, Water quality, Water quality control, Phosphates, Adoption of practices, Administrative decisions.
Identifiers: Administrative regulations.

Michigan has adopted regulations requiring a person engaged in the sale or distribution of cleaning agents or water conditioners to file a written report stating the percentage of phosphorus by weight for each product. In addition, before any person may sell or distribute a new, reformulated or altered cleaning agent or water conditioner, such person must file the following: (1) a written statement that the product is not likely to cause unlawful pollution; (2) a written statement setting forth the percentage of phosphorus by weight in the product; (3) any additional requested information which is necessary to protect the waters of the state from unlawful pollution. Finally, written statements pursuant to this regulation may be contested by the commission, with notice and a hearing required in accordance with these rules before any determination of contested issues are made. (Nursey-Florida)
W76-04382

MONTANA REGULATION ON WATER POLLUTION FROM LIVESTOCK FEEDING.
Montana Board of Health and Environmental Sciences, Helena.
In: 1973 BNA Environmental Rep 831:0541-42 (Mont Bd of Health and Environ Sciences Regs for the Control of Water and Air Pollution from Confined Livestock Feeding, 1972). 2 p.

Descriptors: *Montana, *Administrative agencies, *Farm wastes, *Water pollution control, *Permits, Legal aspects, Water law, State governments, Legislation, Livestock, Water pollution sources, Pollutants, Organic wastes, Water quality, Water quality control, Farm management, Regulation.
Identifiers: Administrative regulations.

The Montana Board of Health and Environmental Sciences has adopted regulations implementing the Water Pollution Control Act and Clean Air Act of Montana as they pertain to confined livestock feeding operations. Under the regulations, the operation of any proposed new or enlarged confined livestock feeding operation which may discharge drainage water or manure to a state water must obtain a livestock waste control facility permit before the operation is started or an existing operation is enlarged. Furthermore, the operation of any currently existing confined livestock feeding operation which may discharge drainage water or manure to a state water must apply to the Department of Health and Environmental Sciences for a livestock waste control facility permit within 24 months of the effective date of this regulation. Such permit, temporary permit or variance may be granted subject to stated conditions; and may be revoked if it was procured by misrepresentation, or the operator has violated a condition of the permit, or the operator has not provided needed additional or improved facilities to prevent pollution within such reasonable time as is allowed by the Department. (Nursey-Florida)
W76-04383

NEBRASKA ENVIRONMENTAL PROTECTION ACT.
Nebraska State Dept. of Environmental Control, Lincoln.
In: 1973 BNA Environmental Rep. 836:0101-16 (Neb. Rev. Stats. Reissue 1943, 1971 Supp. as amended by LB 1435, Laws 1972, and LB 194, LB 254 and LB 538, Laws 1973). 16 p.

Descriptors: *Administrative agencies, *Adoption of practices, *Nebraska, *Water quality standards, *Water pollution control, Water pollution, Grants, Disposal, Sewage treatment, Fish, Wildlife, Permits, Public health, Construction, Recreation, Installation, Operation and maintenance, Administrative decisions.

In 1971 Nebraska enacted legislation establishing a new Solid Waste Division and merging the Water Pollution Control Council and the Air Pollution Control Council. This legislation, known as the Environmental Protection Act, also established a control council responsible for setting water quality standards to be applicable to the waters of the state. Other provisions of the Act include: (1) the council shall give due notice and conduct public hearings before establishing, amending, or repealing water quality standards; (2) the Department of Environmental Control shall have the powers to administer provisions of the Act; (3) whenever the council has reason to believe that any provision of the Act has been violated, it may take certain specified steps to correct the alleged violation; and (4) any person denied a permit by the council is entitled to a fair hearing. Provision is also made for immediate action by the secretary in case of emergency, and for the levying of fines and penalties for violations of the act. (Segall-Florida)
W76-04384

LIVESTOCK FEEDLOTS ARE POLLUTION SOURCE,
For primary bibliographic entry see Field 5B.
W76-04413

ANIMAL WASTE MANAGEMENT IN MODERN PRODUCTION SYSTEMS,
New York State Coll. of Agriculture and Life Science. Dept. of Poultry Science.
R. J. Young.
Presented at Conference on Agricultural
Processing Wastes in the Eastern Region: A
spective, Philadelphia, Pennsylvania, Decemb
3, 1970, p 53-60, 6 ref.

Descriptors: *Farm wastes, *Oxidation lago
*Waste disposal, Research and developm
*Waste treatment, Odor, Water pollu
Nutrients, Fertilizers, *Dehydra
*Incineration.
Identifiers: Waste management, Land disposa

The design of animal production units of the f
must take into consideration the conditions n
sary for optimum production with a manage
system that will minimize environmental poll
The encroachment of resort and resid
developments into rural areas increases this n
sity. It is essential that the cost of livestock o
tion include waste handling and disposal cos
the College of Agriculture at Cornell Unive
an Interdepartmental Task Force has
developed with representatives from the D
ment of Agricultural Economics, Agricultur
gineering, Agronomy, Animal Science,
Science, and Poultry Science to investigate
management problems as waste disposal sy
odor identification and control, water po
prevention, nutrient removal, reutilizati
animal wastes as fertilizers or foodstuffs, an
methods of waste management which
economically become part of the total prod
system. Studies discussed include: (1) use
oxidation ditch in a poultry house, (2) incine
of poultry manure, (3) dehydration of p
manure with heated air, and (4) water po
from land disposal of manure. (Merryma
Central)
W76-04414

AN ASSESSMENT OF THE AGRICULT
AND PROCESSING WASTE PROBLEMS
CONTROL IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Agric
Experiment Station.
A. D. Longhouse.
Presented at Conference on Agricultur
Processing Wastes in the Eastern Region:
spective, Philadelphia, Pennsylvania, Dece
3, 1970, p 68-73, 1 tab.

Descriptors: *Farm wastes, *Regulation,
Virginia, *Agriculture, *Water pollution
*Air pollution, Soil contamination, Public h

Pollution of air, water, and soil from agri
sources is not yet a serious problem in W
ginia, but it is growing. Legislative acts de
authority for the control of all sources and
pollutants, including those of agricultu
vested in several state agencies. The three
tory agencies of West Virginia which are r
ble for enforcing pollution laws are: t
Board of Health, the Department of
Resources, and the Air Pollution Control
sion. The State Board of Health supervi
controls the Department of Health and ma
enforces health regulations. This regul
cludes dairies, creameries, and slaughte
The Department of Natural Resources adm
the Water Pollution Control Act and the
Mining Act. The Air Pollution Control
sion administers the Air Pollution Law
Virginia. In practice, no single regulatory
sole jurisdiction and responsibility regardi
tion. Each agency's involvement correspo
its areas of interest. (Merryman-East Cent
W76-04415

POLLUTION-CONTROL TECHNIQUE
REQUIREMENTS,
Illinois Univ. at Urbana-Champaign.
Agricultural Engineering.
A. J. Muehling, and D. L. Day.
In: Vertical Coordination in the Pork
Proceedings, AVI Publishing Compa

ort, Connecticut, 1971, p 127-138. 5 fig, 7

ptors: *Farm wastes, *Regulation, *Illinois, ltural runoff, Odor, Permits, *Hogs, Water on control, Waste treatment, Water quality rds.
iers: *Pollution control, *Waste handling.

bjectives are to (1) examine the regulations ing pork producers in Illinois; (2) provide nes for producers to use in planning swine tions; and (3) discuss systems for handling nanure. To carry out the objectives of the linois Environmental Protection Act, three s were created: the Pollution Control the Environmental Protection Agency, and titute for Environmental Quality. These s and their functions are briefly discussed. e regulations governing registration, ru- dor, handling and disposal of swine wastes mined. Suggested pork producer guidelines plan an approved method of swine waste g; (2) consider odor nuisances in locating lity; (3) control runoff and manure over-) be considerate of neighbors; and (5) prac- od housekeeping. Simple, complex and ed systems for handling swine manure are ed. They include: (1) solid floors--scrape nd haul; (2) slotted floors--store and haul; tted floors--lagooning and hauling; (4) floor--oxidation ditch and lagoon; and (5) gutter--lagoon and irrigation. Future anagement possibilities have the common e of utilizing wastes, instead of creating a problem. Pollution control regulations result in a concern for uniformity in the ons, stronger pork producers' organiza- nd cooperation with agencies on regula- verning pork installations. (Penrod-East

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INES FOR CATTLE FEEDLOT

State Univ., Bozeman. Dept. of Agricul- gineering.
ine.
Report AE-102, Presented at 1971 Mon- rition Conference, February 8-9, 1971, 18

ors: *Farm wastes, *Feed lots, *Design *Montana, Locating, Confinement pens, llution control, *Waste treatment, Waste

rs: Animal health, Unpaved lots, Paved off control, Waste management.

already has the feed and cattle resources a feedlot industry can be based. En- guidelines for establishment of feedlots ssed. The general functional requirement dlot is to produce a pound of beef at the ssible cost, subject to a possible quality t. The main materials handled in a feedlot , animal wastes, feed, and cattle. Feedlot l requirements and criteria are related to wing factors: (1) Materials handling, (2) n of equipment and labor, (3) Production iency, (4) Animal health, and (5) Water pollution control. Design criteria are nto two categories: (1) Location and site nts, and (2) Facilities design. Each is discussed. The physical requirements alternatives are given. Waste manage- rnatives for various production methods ssed. Housed feedlots have, in general, l the 'runoff' problem from the feedlot general procedure is outlined for the ent of a major feedlot installation. ast Central)
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OF RESEARCH AND RECOMMEN- ON ANIMAL WASTE MANAGE-

MENT CONTROL MEASURES FOR MONTANA WITH SPECIAL REFERENCE TO BEEF CATTLE FEEDLOTS,
Montana State Univ., Bozeman. Dept. of Agricultural Engineering.
C. M. Milne.
Special Report AE-101, November 10, 1970, 36 p, 3 tab, 29 ref.

Descriptors: *Montana, *Feed lots, *Cattle, *Regulation, *Farm wastes, Reviews, Water pollution control, Wast treatment, Waste disposal.
Identifiers: *Waste management, *Pollution control.

Definite steps are underway in Montana toward developing a State animal waste control policy. This report provides guidance for the development of a suitable State policy and administrative mechanism for preventing pollution from livestock operations in Montana. Four categories of potential pollution are discussed. Organic pollution, inorganic pollution, bacteriological pollution and esthetic pollution (nuisance). The major factors contributing to feedlot pollution potential are location, hydrology, feedlot concentration and feed supply. Waste management alternatives for both solid and liquid wastes include: biological stabilization, land disposal for crop growth, high rate land disposal, composting, vacuum filtration, trickling filters, etc. Five procedures to deal with feedlot runoff are discussed (1) Uncontrolled release to a stream, (2) controlled release to a stream, (3) evaporation, (4) controlled release to land, and (5) biological treatment. Returning the wastes to the land for crop production is the most economically feasible system for Montana. A list of recommendations for regulations governing feedlots and a possible outline of feedlot design criteria are given. (Penrod-East Central)
W76-04431

TO EXPAND THE INDIANA DUNES NATIONAL LAKESHORE (HR 3571).
For primary bibliographic entry see Field 6E.
W76-04439

STORM KING MOUNTAIN (PUMP STORAGE PLANT).
Hearings--Subcomm on Fisheries, Comm on Merchant Marine and Fisheries, House of Rep, 93 Cong 2d Sess, Feb 19, 20, 1974. 395 p, 1 append.

Descriptors: *New York, Hudson River, Environmental effects, *Environmental effects, *Fish populations, *Fishkill, *Pumping plants, *Public utilities, Electric power, Fish reproduction, Fish conservation, Fishing, Sport fishing, Water pollution, Water pollution sources, Water pollution effects, Water pollution control, Water quality, Water quality control, Thermal pollution, Heated water, Nuclear powerplants, Legal aspects, Legislation, Federal government.
Identifiers: *Storm King Mountain Project(NY).

When construction of the Storm King pump storage plant was first approved in 1971, the Federal Power Commission reported that the project's impact on the environment would be minimal. However, significant new evidence has surfaced which indicates that the project may create adverse environmental effects, the most notable being a drastic reduction in fish populations in the affected area. Presented at these hearings were statements and testimony from various concerned individuals and organizations including environmental, conservation, and fishermen's groups generally opposed to the Storm King project, and Consolidated Edison Co. in favor of the project. Addenda to the hearings include graphs and statistical analyses of the Storm King Project. (Nursey-Florida)
W76-04440

PERMITS OF ACTIVITIES IN NAVIGABLE WATERS OR OCEAN WATERS.
Corps of Engineers, Washington, D.C.
Federal Register, Vol 40, No 144, p 31319-31344, July 25, 1975, 26 p.

Descriptors: *Navigable waters, *Dredging, *Landfills, *Permits, *Regulation, *Administrative decisions, *Waste disposal, Standards, Rivers, Streams, Rivers and Harbors Act, Environmental effects, United States, Water quality control, Administrative agencies, Adoption of practices, Fish, Wildlife, Boats, Wetlands, Oceans, Canals.
Identifiers: *Federal Water Pollution Control Act Amendment of 1972, Marine sanctuaries, Fill permits.

This regulation prescribes the policies to be followed by all Corps of Engineers activities in connection with applications for permits authorizing structures or work affecting navigable waters of the United States. This includes the discharge of dredged or fill material into navigable waters, and the transportation of such material for the purpose of dumping it into ocean waters. The regulation administratively defines both navigable waters and waters of the United States and contains provisions covering many diverse areas that may be affected by permit issuance, including: (1) wetlands; (2) fish and wildlife; (3) structures for small boats; (4) canals; (5) seaplane operation; (6) foreign trade zones; and (7) activities in coastal zones and Marine sanctuaries. Further, matters relating to permit application procedures and to public meeting and hearings are covered. The delegation of authority to issue and deny permits for disposal of dredged materials is outline in the appendices. (Parrish-Florida)
W76-04441

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 143, p 27078-27084, July 24, 1975, 7 p.

Descriptors: *Permits, *Regulation, *Administrative decisions, *Waste disposal, *Adoption of practices, United States, Legislation, Water quality, Administrative agencies, Decision making, Pollutants, Water quality control, Water pollution control, Pollution abatement, Control.
Identifiers: *National Pollution Discharge Elimination System(NPDES), Federal Water Pollution Control Act Amendments of 1972, Effluent limitations.

In 1973, Procedures were established for issuance of National Pollutant Discharge Elimination System (NPDES) permits. This notice amends certain of those procedures. The major changes are: (1) the requirment for public notice of each complete permit application has been changed to require public notice of the proposed issuance or denial of a permit; (2) public hearings are now required where there is significant public interest in the permit; (3) adjudicatory hearings will now be held after a proposed applicant has received his permit; (4) a contested provision of a permit does not become effective until all administrative remedies are exhausted; (5) a permit applicatnt is now in the same position as other interested persons and must make his employees and consultants available for examinations; (6) issues of law must be submitted to the Environmental Protection Agency (EPA) for decision; and (7) appeals from decisions of the Regional Administrator have been expanded to permit appeals of initial decisions. It is hoped these changes will ensure the fair and orderly administration of the issuance of NPDES permits. (Parrish-Florida)
W76-04442

VARIANCE PROCEDURES IN EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 156, p 28926-28927, August 12, 1974, 2 p.

Descriptors: *Administrative agencies, *Effluents, *Water pollution sources, *Industrial wastes, *Federal government, Water pollution control, United States, Water law, Legal aspects, State governments, Regulation, Abatement, Control Water policy, Water pollution, Water resources, Discharge(Water), Liquid wastes, Navigable waters, Standards.
Identifiers: *Effluent limitations, Administrative regulations.

In response to public comment, the Environmental Protection Agency has inserted a variance clause in its regulations defining effluent levels which various industrial categories are required to achieve by July 1, 1977, for their discharges into navigable waters. The clause provides that any discharger of other interested person may submit to the Regional Administrator or the State, if appropriate, evidence of factors fundamentally different from those considered in the establishment of the guidelines. The Regional Administrator or the State shall then make a written finding on the matter. If the factors involved are indeed fundamentally different, the regional Administrator or the State may substitute effluent limitations either more stringent less stringent then those previously established. Such limitations must then be approved by the Administrator of the Environmental Protection Agency, who may alter them again. This notice includes a list of the regulations in which the variance clause presently appears. (Schilling-Florida)
W76-04443

WATER QUALITY AND POLLUTANT SOURCE MONITORING.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 168, p 31499-31505, August 28, 1974, 7 p.

Descriptors: *Data collections, *Monitoring, *Federal Water Pollution Control Act, *Administrative decisions, *Water pollution control, Federal government, State governments, Governmental interrelations, Water law, Legal aspects, Water pollution, Water quality control, Water quality, Administrative agencies, Regulation, Standards, Toxins, Groundwater, Lakes, Navigable waters, Eutrophication, Data processing.
Identifiers: *Administrative regulations, Effluent limitations, Hazardous substances(Pollution).

This notice concerns proposed regulations for monitoring in state and interstate water pollution control programs. Monitoring is required by Titles I, II, III, and IV of the Federal Water Pollution Control Act, which stipulate that no grant shall be made under Section 106 of the Act to any state, beginning in fiscal year 1974, that has not established an appropriate monitoring program. The Director of the water pollution control agency in each state is required to develop and implement a strategy for progressing systematically toward implementation of the requirements set forth in this notice. These requirements include: (1) development of a monitoring strategy; (2) supporting the state continuing planning process; (3) evaluation of water quality standards; (4) toxic pollutant and groundwater monitoring; (5) classification of publicly owned fresh water lakes by eutrophic conditions; and (6) collection, evaluation, and analysis of the basic information needed for the annual inventory reports required by Section 305(b) of the Act. Written comments on the proposed regulations are invited. (Schilling-Florida)
W76-04444

GLASS MANUFACTURING POINT SOURCE CATEGORY--PROPOSED EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS OF PERFORMANCE AND PRETREATMENT STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 39, No 163, p 30281-30294, August 21, 1974, 14 p.

Descriptors: *Federal Water Pollution Control Act(FWPCA), *Adoption of practices, *Effluents, *Industrial wastes, *Water pollution control, Water law, Legals aspects, Federal government, Administrative agencies, Water pollution, Costs, Wastes, Water pollution sources, Liquid wastes(Water), Waste water(Pollution), Economic impact, Technology, Abatement, Pollutants, Water quality control, Measurement, Standards, Regulation.
Identifiers: Effluent limitations, Administrative regulations, *Glass manufacturing, Point sources(Pollution), Hazardous substances(Pollution).

Pursuant to provisions of the Federal Water Pollution Control Act, the Environmental Protection Agency has proposed effluent limitations and performance and pretreatment standards for the glass manufacturing point source category. The proposed regulation will amend 40 CFR Part 426 by adding the following subcategories of manufacturing: Glass Containers, Machine Pressed and Blown Glass; Glass Tubing; Television Picture Tube Envelopes; Incandescent Lamp Envelopes; and Hand Pressed and Blown Glass. The regulation for each listed subcategory include effluent limitation guidelines representing the degree of effluent reduction attainable through application of the best practicable control technology that are currently available and economically feasible. In addition, there is a summary of conclusions concerning various topics, such as: (1) waste characteristics; (2) origin of waste water pollutants; (3) treatment and control technology; (4) cost estimates for control of waste water pollutants; (5) energy requirements; and (6) non-water quality environmental impacts. (Schilling-Florida)
W76-04445

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY (EFFLUENT LIMITATIONS AND GUIDELINES).
Environmental Protection Agency, Washington, D.C.
40 Fed Reg 8530-35 (1975). 6 p, 13 tabs.

Descriptors: *Copper alloys, *Federal Water Pollution Control Act, *Waste disposal, *Water pollution control, *Effluents, Environmental effects, Regulation, Legislation, Water quality, Administrative agencies, Adoption of practices, Waste water(Pollution), Federal government, Sewage treatment, Treatment facilities, Environmental control, Treatment.
Identifiers: *Non-ferrous metal, Administrative regulation.

The Environmental Protection Agency has proposed amendments to Chapter 40 of the Code of Federal Regulations concerning established effluent limitation and guidelines for existing sources and standards of performance and pretreatment standards for new sources for the noferrous metals manufacturing point source category. The proposed regulation will incorporate pretreatment standards for existing sources and standards of performance and pretreatment standards for existing sources and standards of performance and pretreatment standards for new sources into its existing subcategories of (1) primary copper melting; (2) primary copper refining; (3) secondary copper; (4) primary lead; and (5) primary zinc. Section 307(b) of the Federal Water Pollution Control Act requires such regulation standards for pollutants introduced into publicly owned treatment works. Federal regulations establish that EPA will propose scuch s pretreatment standards at the time effluent tions are established for point source disc The pretreatment standards of effluent limi were based upon the best practicable technology available as required by federal tion. (Welch-Florida)
W76-04447

OIL AND HAZARDOUS SUBSTANCE LI TY.
Coast Guard, Washington, D.C.
39 Fed Reg 41989-94 (1975), 6 p.

Descriptors: *Oil pollution, *Oil spills, water(Pollution), *Federal Water Pollutio trol Act, *Coast Guard Regulations, Wast disposal, Pollution taxes(Charges), Legal Disasters, Water quality control, Water standards, Water pollution control, Oil, W icy, Water pollution sources, Penalties Navigable waters, Administration, Reg Costs.
Identifiers: Federal Water Pollution Con Pollution Fund, *Hazardous substances, Water Pollution Control Act Amendments Coastal zone management, Coastal wat ministrative regulations.

The Coast Guard has proposed revising th tions under section II of the Federal Wat tion Control Act to conform with the Amendments of 1972. The significant would relate to the discharge and repo hazardous substances into navigable wat FWPCA requires that any such dischar ported but there are no penalties discharge or failure to report, nor liabilit cost of removal. The proposal treats h substances in a manner similar to oil; thus responsible for notification, removal, e requirements and discharge penalties wit to oil would be under the same obliga respect to hazardous substances. Determi a hazardous substance would be made b vironmental Protection Agency. The Co has also proposed guidelines which o operators of vessels or onshore facilities 'coastal waters' will follow in the ev discharge, including procedures to co remove discharges and guidelines to removal contingency plans with an Coordinator'. A further amendment clarification of policies, procedures and requirements concerning payments deposits into the Pollution Fund authori FWPCA. (Welch-Florida)
W76-04452

RUBBER PROCESSING POINT CATEGORY.
Environmental Protection Agency, W D.C.
40 Fed Reg 18172-73 (1975), 2 p.

Descriptors: *Industrial wastes, *Clas *Water quality standards, *Effluent water disposal, Pollutants, Standard water(Pollution, Maintenance, Oil, Indu pollution, Emulsions, Federal governm quality control.

Proposed herein are amendments to t limitations and guidelines for existing s standards of performance and pretreat dards for new sources for the tire and segment of the rubber processing po category. Provisions applicable to dis process waste water pollutants resultin production of pneumatic tires and inn tire and inner tube plants are included 'process waste water', in the case of tir tube plants constructed before 1959, is is further declared that all plants cons fore 1959 shall employ the best practic tenance and housekeeping practices

ze discharge of oil and grease in nonprocess vaters. There are also minor amendments to ulsion crumb rubber subcategory, the solu- umb rubber subcategory, and the latex subcategory. (Segall-Florida)
453

R QUALITY STANDARDS.
nmental Protection Agency, Washington,

ral Register, p 18170-71 (1975), 2 p.

tors: *Idaho, *Federal Water Pollution Act(FWPCA), *Dissolved oxygen, *Water quality standards, Standards, Oxeservoirs, Aeration, Saturation, Fisheries, Streams, Reach(Streams), Irrigation water, almonids, Construction, Operations, Jun, Navigable waters.
ers: *Snake River.

te of Idaho has amended their water quali- ards for dissolved oxygen for the segment Snake River from American Falls Dam eam to Lake Walcott from 90 percent of n or 6 mg/l, whichever is greater, to 6 his amendment was made because a d replacement dam project in the area will existing design features so that natural n will not occur. The American Falls ir District has proposed to supplement the gen in released waters by adding oxygen l be trucked to the project. The new n dissolved oxygen content of 6 mg/l will fere with or be injurious to any use made affected waters. Finally, this amendment ly only if the proposed dam project is d and begins operation. (Segall-Florida)
54

IA WATER QUALITY CONTROL ACT.
ary bibliographic entry see Field 6E.
58

SUPPLY QUALITY CONTROL.
ary bibliographic entry see Field 6E.
51

FIELD MARINE BANK V. POLLUTION OL BOARD (APPEAL FROM DENIAL RIANCE FROM BAN ON FURTHER CTION OF SANITARY DRAINAGE S TO SEWER).
ary bibliographic entry see Field 6E.
54

FIELD MARINE BANK V. POLLUTION OL BOARD (APPEAL FROM DENIAL IANCE FROM BAN ON FURTHER TIONS OF SEWER OUTLETS TO

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S V. COBB COUNTY COMMISSION E CAUSED BY SEWER OVERFLOW NDOMINIUM).
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V CONSOLIDATED COAL CO ORY PROHIBITION AGAINST ION OF SEDIMENT IN PUBLIC BY STRIP-MINING HELD DENIAL ROCESS).
y bibliographic entry see Field 6E.

ATION COUNCIL V COSTANZO PER'S FILLING ACTIVITY OF WET-

LANDS A VIOLATION OF FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W76-04473

METROPOLITAN SANITARY DISTRICT V. UNITED STATES STEEL CORPORATION (ABATEMENT OF WATER POLLUTION OF LAKE MICHIGAN).
For primary bibliographic entry see Field 6E.
W76-04500

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

DERIVATION AND EVALUATION OF RESERVOIR RULE CURVES,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-04014

CALIBRATION OF THE STATE WATER PLANNING MODEL FOR SUB-BASIN 42-KJ OF THE YELLOWSTONE RIVER BASIN,
Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 4A.
W76-04232

6B. Evaluation Process

DEVELOPMENT PRIORITIES IN THE WEST RIVER REGION, NORTH DAKOTA, A SOCIAL ATTITUDE AND COMMUNICATION ANALYSIS,
North Dakota Univ., Grand Forks. Communication Research Center.
J. E. Bowes, and K. R. Stamm.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 504, $6.75 in paper copy, $2.25 in microfiche. Research Report, October 1974. 146 p, 44 fig, 26 tab, append. OWRT A-041-NDAK(1). 14-31-0001-5034.

Descriptors: *Social aspects, Water resources development, Planning, Surveys, *Area redevelopment, *North Dakota, *Attitude, *Communication, Social values, Social change, Rural sociology, *Priorities.
Identifiers: West River Diversion region(N Dak).

Social attitudes and degree of communication concerning development priorities in West River Region of North Dakota were analyzed using written surveys. There was limited awareness of the West River Diversion Project. Among those aware problems identified included aspects of coal development, water management, pollution and agriculture. Federal agencies were more frequently criticized than state agencies as being unresponsive to local needs, but there was good correlation between problems identified by agencies and the general public. Information from agencies tended to diffuse indirectly and there was minimal communication among citizens with similar concerns. A series of suggestions are made to change the situation.
W76-04007

DERIVATION AND EVALUATION OF RESERVOIR RULE CURVES,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-04014

COMMUNITY VALUES AND COLLECTIVE ACTION IN RESERVOIR DEVELOPMENT,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
G. L. Bultena.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 499, $7.50 in paper copy, $2.25 in microfiche. Completion Report, No 69, Iowa State Water Resources Research Institute, September, 1975. 184 p, 19 ref, 4 append. OWRT B-020-IA(2). 14-31-0001-3587.

Descriptors: *Attitudes, *Reservoirs, *Social impact, *Social values, Decision making, Political aspects, Psychological aspects, Project benefits, Recreation demand, *Iowa, Pre-impoundment, Community development, Water quality, Social participation.
Identifiers: Ames Reservoir(Ia), Des Moines(Ia), Jeffereson Reservoir(Ia), Ledges State Park(Ia), Saylorville Reservoir(Ia).

Reactions of Iowans (N=1,000) to three large reservoir projects were surveyed. Information was obtained about their knowledge of the projects, their assessments of project desirability, their evaluations of likely personal benefits and costs of reservoirs, and personal actions they had taken to influence government decision making on the reservoirs. Major findings were: (1) a generally low level of public acquaintance with the proposed projects, (2) a preponderance of public opposition to two of the projects, (3) relatively low levels of public concern about water quality and flooding problems that the reservoirs were designed to alleviate, (4) substantial recreational use being made of the undeveloped reservoir sits, and (5) considerable skepticism about citizen's abilities to influence government decision making on these projects. Factors have hypothesized importance to the several attitudinal and knowledge variables were tested. Examination also was made of the nature and dynamics of agency-public confrontations over the reservoir projects.
W76-04015

REPORT FOR THE FISCAL YEAR 1972 - 1973: STUDY OF THE ST. LAWRENCE RIVER.
St. Lawrence River Working Group, Quebec.
For primary bibliographic entry see Field 4A.
W76-04166

MONOGRAPH ON COMPREHENSIVE RIVER BASIN PLANNING.
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 4A.
W76-04175

INDICATORS OF CHANGE IN THE RECREATION ENVIRONMENT: LAW AND ENVIRONMENTAL PLANNING,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
For primary bibliographic entry see Field 6G.
W76-04328

INLAND WETLANDS: TECHNICAL DEFINITIONS DIRECTED TOWARD EMERGING POLICY ALTERNATIVES,
Connecticut Univ., Storrs. Inst. of Water Resources.
T. B. Helfgott, and M. W. Lefor.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 815, $3.50 in paper copy, $2.25 in microfiche. Research Project Technical Completion Report, December 31, 1975. 16 p, 3 ref, append. OWRT B-010-CONN(2). 14-31-0001-5062.

Descriptors: *Wetlands, Freshwater, *Land use, *Legal aspects, *Administrative decisions, *Political aspects, Public health, Aquatic habitats, Aquatic plants, *Connecticut, Algae, Water policy, Alternative planning.

Identifiers: Functional role of wetlands, Definition of wetlands, Delineation of wetlands, Wetlands metabolism, Wetlands commissions.

A multifaceted, interdisciplinary definition of inland wetlands was formulated through a series of conferences, seminars and research directed toward an understanding and conservation of inland wetlands. Data from the following subject areas were considered in the formulation of the definition: botany, with habitat and vascular plant association and algal species lists compiled; limnology, with emphasis placed on the chemical interplay between wetlands and lakes; political sciences, with a profile report on Connecticut Wetland Commissions included; natural resources; soil engineering; and public health aspects. The 'idealized' definition is now being legally reviewed with two endpoints in mind: (1) the formulation of an ideal, comprehensive legal definition to suggest to other states and regions, and (2) the formulation of an amendment to the present Connecticut wetland laws in order to more effectively conserve wetlands in Connecticut. (de Lara-Connecticut)
W76-04389

A MULTIDISCIPLINARY APPROACH TO SOLVING COMMUNITY WATER PROBLEMS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 10D.
W76-04391

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE ECONOMICS OF SEWERAGE PRICING AND INVESTMENT POLICIES: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-04008

MONOGRAPH ON COMPREHENSIVE RIVER BASIN PLANNING.
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 4A.
W76-04175

6D. Water Demand

THE ECONOMICS OF SEWERAGE PRICING AND INVESTMENT POLICIES: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-04008

STATISTICAL ESTIMATION OF A DEMAND FUNCTION FOR RESIDENTIAL WATER,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
H. M. Kitchen.
Social Science Series No 11, 1975. 9 p, 3 tab.

Descriptors: *Water supply, *Water demand, *Statistics, Marginal costs, Pricing, Control, *Estimating, Costs, Decision making, Unit costs, Instrumentation, Model studies, Regional analysis, Regression analysis, Use rates, Water rates, *Domestic water.
Identifiers: *Residential water, Consumers, Consumption impact, Regional variations, Dwelling units.

The objective is to define and statistically test factors that are felt, on an a priori basis, to affect significantly the residential demand for water. Using 'ordinary least squares' regression, cross-sectional models are constructed on the basis of 1971 data for 57 urban centres with populations over 10,000. Essentially the influence of climatic factors, population, household size, income and price are tested. Whereas consumers under a flat-rate system are faced with a marginal price of zero, consumers in metered consumption areas face a positive marginal price. As a result, separate models are tested for centres imposing flat-rate charges and for metered centres. To test the impact of metering per se, a compositive model in which all centres are included is constructed. Consumers in flat-rate areas do not have an economic incentive to regulate water use, and as a result, their consumption patterns exhibit wide random variance. The model for metered centres is capable of explaining more of the variation in interurban area consumption, although the commodity price variable itself does not show the relationship to consumption that is hypothesized. It is concluded that the model is not suitable for determining the effects of unit price charges; the extreme significance of the metering dummy variable, however, does suggest that water consumption is subject to some economic consideration. Then, there are obvious policy implications. A negative relationship between consumption and average rainfall for 1971 suggests that consumers are responsive to water conservation efforts during seasonal peak periods. (Environmental Canada)
W76-04236

LEGAL PROBLEMS INVOLVED IN DEVELOPING WATER SUPPLIES FOR ENERGY DEVELOPMENT,
Debevoise and Liberman, Washington, D.C.
For primary bibliographic entry see Field 3E.
W76-04336

WATER DEMANDS FOR ENERGY DEVELOPMENT,
New Mexico Univ., Albuquerque. Dept. of Economics.
A. V. Kneese, and F. L. Brown.
Natural Resources Lawyer, Vol 8, No 2, p 309-33 (1975). 25 p, 5 tab, 8 fig.

Descriptors: *Colorado River Basin, *Missouri River, *Water demand, *Energy, *Water resources, Energy conversion, Electric power, Cooling, Evaporation, Mining, Runoff, Discharge(Water), Air pollution, Fossil fuels, Groundwater, Irrigation, Interbasin transfers, Agriculture, Streamflow, Synthetic hydrology, Navigation, Water quality, Recharge, Aquifers.
Identifiers: *Absolute water scarcity.

The continued use of water in energy development presents important questions concerning the impact on water supplies and aquatic ecological systems. Te consumptive use of water for energy extraction and conversion processes reduces the amount of water available for other uses and may lead to 'absolute scarcity', a situation in which there is a lesser physical amount of water available than would otherwise be consumed. Absolute water scarcity is not a problem for the nation as a whole, but it does present problems in some arid regions, especially the Upper Missouri and Upper Colorado River Basins. The Colorado is a highly developed, already overworked river which now faces the prospect of a crushing absolute scarcity of water. In comparison, the Yellowstone-Upper Missouri is a relatively primitive situation where the water energy issues are primarily environmental, qualitative rather than quantitative. Other factors discussed that affect the amount of water used in energy development include: (1) scale of development; (2) location of processing facilities; (3) energy development options; (4) specific technology designs for particular options; (5) degree of reclamation of mined land achievable; and (6) public policy. (Segall-Florida)
W76-04337

MODELS FOR MUNICIPAL AND INDUST WATER DEMAND FORECASTING IN NO CAROLINA,
North Carolina Univ., Chapel Hill. Dept. vironmental Sciences and Engineering.
D. T. Lauria, and C. H. Chiang.
Available from the National Technical Inf tion Service, Springfield, Va 22161 as PB-24 $5.00 in paper copy, $2.25 in microfiche. Carolina Water Resources Research In Raleigh, UNC-WRRI Rpt. No. 110, Nov 1 p, 3 fig, 23 tab, 27 ref. OWRT B-060-NC(1). 0001-3920.

Descriptors: *Forecasting, *Water require *Water demand, *Municipal water, *Inc water, Population, Average income, R *Mathematical models, Industrial use, Mo dies, *North Carolina, Cities.

A mathematical model for forecasting the requirements of North Carolina municipali been developed and verified; it explicitly e industrial water usage. The model was de from a sample of about 90 municipalities lo Northern and Southern Piedmont section State. Baseline data were obtained for the 1970-72. The model includes three predicto bles: population, average annual per ca come, and annual rainfall. The R2 value o in regression analysis for the multiplicativ is 0.88, and the overall F statistic for sign of regression is about 200 with 3 and 85 de freedom. Several additional models wer and rejected before the final one emerged; these included such variables as water p the number of commercial workers in to final model was verified by predicting wat in 20 municipalities in the western part of for which actual usage data are avai separate model has been developed and c for predicting industrial water require N.C. Extensive data for verification are s available, but verification with existing tion, although limited, is excellent. Thi makes use of the State's input-outpu developed by Research Triangle Institute It includes 58 industrial sectors in each of gions within the State plus the Rest-of-W principal contribution of this study inclu of industrial water usage coefficients w developed from published sources (Stewart-North Carolina State)
W76-04390

6E. Water Law and Institutio

COMMUNITY VALUES AND COLL ACTION IN RESERVOIR DEVELOPME
Iowa State Univ., Ames. Dept. of Soci Anthropology.
For primary bibliographic entry see Field
W76-04015

CANADA WATER ACT, ANNUAL R 1974 - 1975.
Department of the Environment, (Ontario).
English and French, 1975. 29 p, 1 tab.

Descriptors: *Governments, *Water ment(Applied), *Planning, *Water la resources development, Research and ment, Government supports, Governme relations, Project planning, Nutrients, D tions, Data storage and retrieval, Water Water quality, *Canada.
Identifiers: *Canada Water Act.

This annual report, covering operations 31, 1975, first sketches the main provis Canada Water Act, and then briefly some of the more important programs been or are expected to be undertake those provisions. Details of implementa

s, planning studies, and other cooperative ar-
ements entered into are given along with in-
ation on the program to regulate nutrient
ses and on other programs to improve the
al water management capability.
ronment Canada)
04152

USHIMA OIL SOILL,
onmental Protection Service, Ottawa
rio). Environmental Emergency Branch.
rimary bibliographic entry see Field 5G.
04159

KENZIE BASIN INTERGOVERNMENTAL
ON COMMITTEE - FIRST REPORT (TO
MBER 31, 1974).
enzie Basin Intergovernmental Liaison Com-
, Ottawa (Ontario).
nation Canada, Ottawa, 1975. 35 p, 2 maps.

iptors: *Governments, *Water policy, Water
ces, Water management(Applied),
rnmental interrelations, *Canada, River
levelopment.
iers: Provincial government activities,
l government activities, Joint programs,
nzie Valley Pipeline, Athabasca River,
River, British Columbia, Alberta,
chewan, Northwest Territories, Yukon Ter-

the first annual report of the Mackenzie
International Liaison Committee prepared
rm the various governments and general
on the deliberations of the committee. In-
ion concerning provincial activities in the
Alberta, Saskatchewan, British Columbia),
ment of Canada activities, as well as joint
-provincial projects is included.
onment Canada)
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RCH PROGRAM - HYDROLOGY
RCH DIVISION - SUMMARIES OF
RESS AND SHORT RESEARCH RE-
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ment of the Environment, Ottawa
o). Water Resources Branch; and Depart-
f the Environment, Ottawa (Ontario). In-
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nary bibliographic entry see Field 2A.
239

ROCESSING OPERATIONS LIQUID EF-
T GUIDELINES.
mental Protection Service, Ottawa
). Water Pollution Control Directorate.
nary bibliographic entry see Field 5G.
240

POLLUTION CONTROL
TORATE PUBLICATIONS.
mental Protection Service, Ottawa
).
ary bibliographic entry see Field 5G.
253

A CENTRE FOR INLAND WATERS,
Centre for Inland Waters, Burlington
).
ary bibliographic entry see Field 5G.
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TORS OF CHANGE IN THE RECREA-
NVIRONMENT: LAW AND ENVIRON-
L PLANNING,
ent of Justice, Washington, D.C. Land
ral Resources Div.
ary bibliographic entry see Field 6G.
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THE PROTECTION OF THE ENVIRONMENT AND WORLD PUBLIC ORDER: SOME RECENT DEVELOPMENTS,
Yale Univ., New Haven, Conn. School of Law.
For primary bibliographic entry see Field 6G.
W76-04329

SYSTEMS DESCRIPTION OF THE U.S. COAST GUARD MARITIME ENVIRONMENTAL PROTECTION PROGRAM,
For primary bibliographic entry see Field 5G.
W76-04330

A SURVEY OF REMEDIES (TO WATER POLLUTION AND WATER SCARCITY PROBLEMS).
Stanford Environmental Law Society, Calif.
For primary bibliographic entry see Field 5G.
W76-04331

COMPENSATION FOR OIL POLLUTION DAMAGE RESULTING FROM EXPLORATION AND EXPLOITATION OF HYDROCARBONS IN THE SEABED,
Compagnie Francaise des Petroles, Paris (France). Dept. of Law.
B. A. Dubais.
Journal of Maritime Law and Commerce, Vol 6, No 4, p 549-73 (1975). 24 p.

Descriptors: *Oil spills, *Cost allocation, *Damages, *Pollution abatement, *International waters, Energy, Ecology, Navigation, Drilling, Negligence, Natural resources, Ships, Pipelines, Marine animals, Marine fish, Oil, Environmental effects, Costs, International law.

Increasing demands for petroleum products have produced a dramatic increase in offshore exploration and drilling. This increase has brought with it an increase in the risk of pollution. Pollution damage includes two elements--direct damage caused by contamination resulting from the discharge of oil and the cost of preventive and clean-up measures. The problem of damages is discussed under both the civil and common law, along with various measures taken by governments and the oil companies to combat oil pollution. The basis of responsibility for both direct damage and preventive measures is then explored under the laws of various civil and common law countries. The conclusion drawn is that the real issue is to determine not who must be held responsible, but rather who can pay and how much. Also discussed are plans created by the oil industry to provide coverage for the risk of pollution, and the prospects for an international legal regime. (Segall-Florida)
W76-04333

GROUND WATER LAW: PROBLEM AREAS,
Arizona Univ., Tucson. Coll of Law.
For primary bibliographic entry see Field 4B.
W76-04334

PROBLEMS UNDER STATE WATER LAWS: INITIATION OF NEW RIGHTS,
R. L. Dewsnup.
Natural Resources Lawyer, Vol 8, No 2, p 347-58 (1975). 12 p, 1 chart.

Descriptors: *Water rights, *Beneficial use, *Water resources development, *Water management(Applied), *Utah, Streams, Appropriation, Diversion, Montana, Water conservation, Planning, Water quality, Flood control, Cloud seeding, Groundwater, Wildlife, Fish, Hydrologic data.
Identifiers: *Hydrologic units.

Several years ago, the accepted notion of appropriation law was that fish and wildlife values, aesthetic considerations, and many instream uses were not 'beneficial uses' and thus could not serve to prevent traditional appropriations and diversions, even where stream depletion would otherwise result. This view is changing in many appropriation states. For example, Utah is conducting an experiment with a prototype program for water resource conservation and development. Under the program, a Unit Advisory Council would develop a draft plan to be reviewed by three separate state level entities before being sent to the state Board of Water Resources. The Board would then hold public hearings on and make amendments to the plan, and a prototype program for two selected hydrologic units would be conducted. If the experiment succeeds, any prospective appropriator could examine the unit plan for the hydrologic unit in which he desired to acquire a water right and immediately determine whether his proposed use was compatible with the plan. An illustrative diagram of institutional arrangements for development and implementation of the state water plan is included. (Segall-Florida)
W76-04335

LEGAL PROBLEMS INVOLVED IN DEVELOPING WATER SUPPLIES FOR ENERGY DEVELOPMENT,
Debevoise and Liberman, Washington, D.C.
For primary bibliographic entry see Field 3E.
W76-04336

WATER DEMANDS FOR ENERGY DEVELOPMENT,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W76-04337

THE FEDERAL RULE OF ACCRETION AND CALIFORNIA COASTAL PROTECTION,
M. C. Whitney.
Southern California Law Review, Vol 48, p 1457-76 (1975). 20 p.

Descriptors: *Federal-state water rights conflicts, *Accretion(Legal aspects), *California, *Coasts, Transportation, Recreation, Management, Jurisdiction, Navigation, Natural resources, Piers, Groins(Structures), Beaches, Construction, Easements, Coastal structures.
Identifiers: Coastlines, *Tidelands, Uplands, Tideland trust.

Disputes concerning tidelands uses are resolved by the judiciary under the tidelands trust concept. California's rule of accretion classifies accretions as tidelands and thus subjects them to the tidelands trust. The federal rule of accretion, however, classifies accretions as uplands and gives any accretion to the owner of the land, thereby failing to implement public interests in the coastline. The California rule provides private landowners with less protection than does the federal rule because it implements the landowner's interests only when those interests are consistent with the public interest. Furthermore, the California rule furthers those public interests in the coastline which the federal rule completely ignores. After the 1967 U.S. Supreme Court case of Hughes v. Washington, the federal rule of accretion applies in California to land which has been the subject of a federal patent, and the California rule applies to all other land. Since most of California's coastal upland was not federally patented, the California rule continues to be generally applicable to the California coastline. In addition, it appears that any assertion of federal jurisdiction over property rights in the coastal zone is inappropriate. (Segall-Florida)
W76-04338

WATER POLLUTION CONTROL IN ALASKA: THE ALASKA ENVIRONMENTAL CONSERVATION ACT OF 1971,
Tennessee Univ. at Nashville.

For primary bibliographic entry see Field 5G.
W76-04340

CRIMINAL JURISDICTION OVER ARCTIC ICE ISLANDS: UNITED STATES V. ESCAMILLA,
L. W. Aubry, Jr.
UCLA-Alaska Law Review, Vol 4, No 2, p 419-440 (1975). 22 p, 90 ref.

Descriptors: *Constitutional law, *Federal jurisdiction, *Arctic Ocean, *Icebergs, *Law enforcement, Islands, Sea ice, International law, Penalties(Legal), Judicial decisions, Public law, Common law, Regulation, Water law, Oceans, United States, Legal aspects.
Identifiers: *Criminal law, *High seas, *Congressional powers.

An American citizen was charged with a murder that occurred on a block of ice floating on the Arctic Ocean. Because the defendant was found innocent, the court never definitely decided the key issue of whether or not the United States had jurisdiction to try the case. According to the author, Congress appears to have the Constitutional power to extend American laws extraterritorially wherever American citizens are involved. If Congress does indeed have such power, it stems from one or more of four possible sources: (1) the high seas clause of the Constitution; (2) a reasonable extension of one of the enumerated powers of Congress; (3) one of Congress' enumerated powers coupled with the 'necessary and proper' clause; or (4) the nationality theory, under which a nation's laws extend to all of its nationals no matter where they are located. These sources are explored to determine if any of them is sufficient to support United States jurisdiction over Arctic ice blocks. The author concludes that, while Congress has the power to regulate the conduct of American citizens on the soil of other nations, this in personam power has not been extended to ice islands. Consequently, the strongest basis for jurisdiction appears to be the high seas clause. (Hoffman-Florida)
W76-04341

AWWA PRINCIPLES OF WATER RESOURCES POLICY (POLICY STATEMENT OF AMERICAN WATER WORKS ASSOCIATION).
American Water Works Association, Denver, Colo.
For primary bibliographic entry see Field 5G.
W76-04342

THE FISHERMEN'S PROTECTIVE ACT: A CASE STUDY IN CONTEMPORARY LEGAL STRATEGY OF THE UNITED STATES,
T. Meron.
American Journal of International Law, Vol 69, No 2, p 290-309 (1975). 20 p, 79 ref.

Descriptors: *Fish harvest, *Boundary disputes, *Commercial fishing, *Foreign waters, *International waters, Legislation, Jurisdiction, Penalties(Legal), Government finance, Economic justification, Intergovernmental relations, Ships, Governmental interrelations, Governments, Foreign countries, Legal aspects, Water law, Political aspects.
Identifiers: *Fishermen's Protective Act, Territorial seas.

The 1954 Fishermen's Protective Act, designed to protect the rights of vessels of the United States on the high seas and in territorial waters of foreign countries provided for reimbursement when vessels of the U.S. are illegally seized by foreign countires claiming an extended territorial sea jurisdiction not recognized by the United States. In practice, the relief given to fishermen under the Act was often limited, since the Act only reimbursed the fishermen for fines, and not for the expensive fishing licenses and other special fees they were often charged. In an effort to eliminate such problems, the Act underwent revisions in 1968 and 1972 to provide for an insurance program whereby fishermen could protect themselves against such losses. The amendments also provided for certain economic sanctions against the seizing foreign country. However, the amendments have had mixed success. While they have encourage the continuation of American fishing operations in disputed areas, they have not discouraged foreign countries from seizing U.S. vessels. (Hoffman-Florida)
W76-04343

SEABED AND SUBSOIL - FEDERAL V STATE CONTROL IN U.S. (DISCUSSION OF UNITED STATES V MAINE).
American Journal of International Law, Vol 69, No 2, p 432-435, (1975). 4 p, 9 ref.

Descriptors: *Ownership of beds, *Subsoil, *Federal-State water rights conflicts, *Submerged Lands Act, *Judicial decisions, Military aspects, Foreign trade, Continental shelf, Oceans natural resources, Federal jurisdiction, State jurisdiction, Political aspects, Legal aspects, Boundary disputes, Boundaries(Property), Resouces development, Coasts.
Identifiers: *Territorial sea.

A special master's report recommended a decree be entered that the United States is entitled, as against the defendant States, to that portion of the seabed and subsoil and the natural resources thereof, underlying the Atlantic Ocean and lying more than three geographical miles seaward from the coast line. The special master relied on an earlier Supreme Court case that held the national interest in defense, international relations, and foreign commerce gave the Federal Government, paramount rights over the territorial sea, together with dominion over the seabed and subsoil. In the same case there was found no historical basis giving the States control over the seabed and subsoil. The States contended that the doctrine of that case was repudiated by Congress when it passed the Submerged Lands Act granting the States dominion over the resources of the seabed within the three-mile limit. The special master rejected this contention, however, finding that by relinquishing to the coastal states rights in such lands within the three-mile limit, the United States confirmed its own rights in submerged lands beyond those limits. (Hoffman-Florida)
W76-04344

THE CALIFORNIA COASTAL ZONE CONSERVATION ACT OF 1972 (PROPOSITION 20) AND COMPARABLE LAND USE LIMITATIONS AFFECTING THE MINERAL INDUSTRY IN OTHER STATES,
Chaplin Petroleum Co., Forth Worth, Tex.
C. A. Zubieta.
Rocky Mountain Mineral Law Institute Annual, Vol. 20, p 283-299 (1975). 17 p, 30 ref.

Descriptors: *California, Wyoming, Montana, Vermont, *Legislation, *Permits, Regulation, Land use, *Land management, *Local governments, *State governments, Legal aspects, Water, Water law, Environmental effects, Environmental control, Land development, Landfills.
Identifiers: California Coastal Zone Conservation Act of 1972(Proposition 20), State policy, Coastal zone management, Fill permits.

In 1972, California voters approved the California Coastal Zone Conservation Act of 1972 (Proposition 20). The Act empowers the State Coastal Zone Conservation Commission and six regional bodies to administer the program of coastal zone protection. Any person wishing to develop a designated area must obtain a permit conditioned upon approval of a majority of the members of a regional commission. No bond is required for a private suit to enforce provisions of the Act. Section 27404 states that persons who began developments prior to passage of the shall have vested rights and be exempt from permit requirement. The Attorney General has sued two opinions which support the position the continued operation of an oil field does require a permit. Legislation in Wyoming Montana promises to be more far-reaching the California Act. Regulation of energy-pro ing sites is the object of siting acts. Verm requires approval of any public or private covering more than ten acres or containing than ten units. Citizens of Denver and Santa bara defeated water projects to support popula growth. (Jenkins-Florida)
W76-04345

PRIVATE INFLUENCE ON ENVIRONMEN POLICY: THE CASE OF THE NATIONAL DUSTRIAL POLLUTION CONTROL COUN
State Univ. of New York Coll. at Cortland. of Political Science.
For primary bibliographic entry see Field 6G.
W76-04346

CASE STUDY OF A HYDROELECTRIC THE DICKEY-LINCOLN SCHOOL PROJEC
Massachusetts Inst. of Tech., Cambridge. Engineering Program.
For primary bibliographic entry see Field 6G.
W76-04347

THE MISSISSIPPI PUBLIC TRUST DOCTI PUBLIC AND PRIVATE RIGHTS IN COASTAL ZONE,
J. J. Johnson, and C. F. Johnson, III.
Mississippi Law Journal, Vol 41, No 1, p (1975). 34 p, 163 ref.

Descriptors: *Wetlands, *Mississippi, *Own of beds, *Public rights, *Water rights, aspects, Legislation, Judicial decisions, tion(Legal aspects), Boundaries(Property), dary disputes, Common law, Eminent d Penalties(Legal), Riparian land, Riparian Water law, State governments, Water utili Law enforcement, Recreation, Fishing, Na waters.
Identifiers: *Public trust doctrine, Coastal Coastal zone management, Contiguous Standing(Legal), Water rights(Non-rip Coastal Zone Management Act of 1972.

This article discusses the approach taken Mississippi legislature and courts concern public trust doctrine. This doctrine states th below ordinary high water marks belongs state as trustee for the public, and recogni importance of public access to waterways ing, navigation, and recreational purpo further accords the State standing in the c enforce the public's rights so held in trust. cases, individual taxpayers may also b standing to enforce the public trust, regar whether or not unique and personal dama be shown. Furthermore, Mississippi cour held that the State cannot convey waterw in trust to private individuals. It is the view that the State should have the power vey coastal wetlands as long as the con serves the public interest. (Nursey-Florida)
W76-04348

ICELAND'S REGULATIONS ESTABLIS FISHERY ZONE WITH A 50-MILE LIM NOT OPPOSABLE TO THE UNITED KI AND THE FEDERAL REPUBLIC O MANY,
D. J. Foucheaux, Jr.
Texas International Law Journal, Vol. 10, 150-71 (1974). 22 p, 130 ref.

Descriptors: *Commercial fishing, *La sea, *Fisheries, *International law, B disputes, Coasts, Jurisdiction, Judicial d

udication procedure, Oceans, Treaties, Legal
cts, Political aspects, Water law, International
r, Fish, Wildlife conservation, Foreign coun-

tifiers: *International agreements, ternational Court of Justice, Jurisprudence, stal waters, Territorial waters.

United Kingdom and West Germany in- ted separate proceedings against the Republic celand in the International Court of Justice. nd's proposed extension of her coastal fishe- jurisdiction to a fifty-mile limit sparked the ites. The Court held that Iceland was not enti- to exclude unilaterally British and German ng vessels from areas between the twelve-mile ifty mile limits. Further, the Court held that arties were obligated to undertake good faith tiations to solve their differences with respect hing rights. This article analyzes the Court's gs in terms of their potential impact on the lopment of international law. The Court, by ing its opinions in terms of opposability, ef- ely circumvented the basic issued, that of alidity, under international law, of Iceland's sed regulations. However, the author sug- that the decisions in these cases are signifi- with respect to the Court's jurisprudence. By g a broad view of its jurisdiction, and of the te itself, the Court assumed an expanded role omoting and guiding settlement of the dispute broader, political context. (Schilling-Florida) 04349

RNATIONAL LAW AND NUCLEAR TEST LOSIONS ON THE HIGH SEAS,
York Univ., N.Y. Center for International es.
Tiewul.
ll International Law Journal, Vol. 8, No. 1, p (1974). 26 p, 89 ref.

iptors: *Nuclear explosions, *Law of the Penalties(Legal), Fallout, Radiation, Water Legal aspects, Oceans, Natural resources, es, International law, Regulation, Judicial ons, Water pollution, Air pollution, Govern- International waters, Ecology, Environ- Adjudication procedures.
fiers: *Standing(Legal), International agree- , Absolute liability, Navigation obstructions, rudence, Hazardous substances(Pollution).

rticle concerns the legality of nuclear test ions on the high seas, and the amount of in- onal liability which attaches to a state en- in such experimentation. The author sup- is conclusion that nuclear tests on the high e illegal with three related areas of interna- law. First, nuclear testing violates legal doc- relating to freedom of the high seas insofar fringes upon navigation and fishing rights. l, the ecological effects of nuclear testing conventional anti-pollution law. Moreover, r testing is expressly forbidden by the wide- ied Nuclear Test Ban Treaty. A more com- estion concerns the juridical consequences al nuclear activity. It is well established that are liable for conducting illegal nuclear However, where the injury involves some international community interest, liability s into complex considerations of the law of g. Recent developments indicate a relaxa- the traditional view, which requires a na- present proof of direct injury. (Schilling-) 350

TIAL HEALTH HAZARDS AND THE N OF PROOF IN ENVIRONMENTAL NS: THE IMPLICATIONS OF RESERVE G.
aw Review, Vol. 60, No. 2, p 299-314 5 p, 192 ref.

Descriptors: *Public health, *Common law, *Water pollution, *Penalties(Legal), *Waste disposal, Legal aspects, Legislation, Federal government, State governments, Judicial decisions, Adjudication procedure, Pollution abatement, Wastes, Environmental effects, Federal Water Pollution Control Act, Water pollution control, Water pollution sources, Water quality control, Water quality standards, Law enforcement.
Identifiers: Nuisance(Legal aspects), Injunctions(Prohibitory), Presumptions(Legal), Congressional hearings, Hazardous substances(Pollution).

This article considers the 'rules of proof' applicable in interstate pollution suits, particularly when the plaintiffs allege an actual or threatened hazard to the public health. The author discusses this issue of burden of proof by exploring the law of nuisance and injunction, the concept of a federal common law, and the treatment of health hazards in non-environmental contexts. The author suggests that, in the absence of specific statutory provisions, the federal common law of public nuisance should be used in determining the requisite burden of proof in interstate pollution suits. After the existence of a public nuisance is established, the focus turns to the question of the proper remedy. The 'balancing of hardships' test is commonly used in determining whether an injunction rather than monetary damages should be granted. The author suggests, however, that since this test generally concerns economic loss or gain to the parties, it is not appropriate when dealing with public health hazards. Courts should grant injunctions more readily when a potential loss of human life exists. (Nursey-Florida)
W76-04351

NATIONAL SAFE DRINKING WATER STRATEGY -- ONE STEP AT A TIME.
Environmental Protection Agency, Washington, D.C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-04354

THE USE AND LEGAL SIGNIFICANCE OF THE MEAN HIGH WATER LINE IN COASTAL BOUNDARY MAPPING,
Spessard L. Holland Law Center, Gainesville, Fla.
F. E. Maloney, and R. C. Ausness.
North Carolina Law Review, Vol. 53, No 2, p 185-273, (December, 1974). 89 p, 605 ref, 1 append.

Descriptors: *High water mark, *Riparian rights, *Boundaries(Property), *Tides, Submerged Lands Act, Tidal waters, Tidal effects, Berms, Littoral, Measurement, Public access, Accretion(Legal aspects), Navigable waters, Avulsion, Marshes, Suveys, Low water mark, Boundary disputes, Bank erosion, Ownership of beds, Shores, Riparian land, Judicial decisions, State governments, Beds under water.
Identifiers: *National Ocean Survey, *Coastal boundaries, Boundary determination, Public trust doctrine, National Environmental Protection Act, Reliction, Ebb-and-flow, Corps of Engineers, Coastal Zone Management Act, Florida Coastal Mapping Act, Artificial accretion, Tidal benchmarks, Tidal datum, Hummocks.

Prerequisite to the development of any regulatory program for coastal waters and resources is an accurate determination of the respective legal interests of both private landowners and the public in coastal areas. Various methods have been used in determining those interests, often with conflicting results. This article presents a comparative survey of past and present methods of water boundary determination, and concludes with a proposed Model Act to resolve the conflicts among the various methods in light of recent developments, such as the Supreme Court decision in Borax Consolidated Ltd. v. City of Los Angeles. In Borax, the term 'ordinary high water mark' was defined to mean the intersection of the tidal plane of mean high water with the shore. No particular relation to physical mark or vegetation line was required. As this article points out, however, coastal boundary line determination still varies from one jurisdiction to another. The authors hope the Model Act will help provide (1) uniform boundary determination guidelines, (2) development of a coastal survey methodology, and (3) implementation of a comprehensive program of coastal zone mapping. (Parrish-Florida)
W76-04355

SAMPLE FLOOD PLAIN ZONING ORDINANCE FOR LOCAL UNITS OF GOVERNMENT.
Minnesota Dept. of Natural Resources, St. Paul. League of Municipalities, Association of Cities.
For primary bibliographic entry see Field 6F.
W76-04356

FLOOD PLAIN MANAGEMENT FOR OREGON CITIES AND COUNTIES.
Oregon Univ., Eugene. Bureau of Governmental Research and Service.
For primary bibliographic entry see Field 6F.
W76-04357

ORDINANCE TO AMEND THE BUILDING CODE OF THE CITY OF GILLETTE, WYOMING.
For primary bibliographic entry see Field 6F.
W76-04358

AN ORDINANCE RELATING TO FLOOD PLAIN MANAGEMENT.
For primary bibliographic entry see Field 6F.
W76-04359

MINIMUM REQUIREMENTS FOR FLOOD CONTROL.
For primary bibliographic entry see Field 6F.
W76-04360

FLOOD PLAIN MANAGEMENT -- FPM-1 AND FLOOD INSURANCE PROGRAM.
Indiana Dept. of Natural Resources, Indianapolis.
For primary bibliographic entry see Field 6F.
W76-04361

MODEL FLOODWAY ORDINANCE (FLOODWAY REGULATION).
North Carolina General Assembly, Raleigh.
For primary bibliographic entry see Field 6F.
W76-04362

PROPOSED FLOOD DISTRICT ORDINANCE.
For primary bibliographic entry see Field 6F.
W76-04363

FLOOD HAZARD REGULATIONS (AMENDMENT TO THE BUILDING CODE).
For primary bibliographic entry see Field 6F.
W76-04364

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION ACT.
Alaska State Dept. of Environmental Conservation, Juneau.
For primary bibliographic entry see Field 5G.
W76-04365

ALASKA WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 5G.
W76-04366

ARIZONA WATER POLLUTION CONTROL LAW.
Arizona State Dept. of Health, Phoenix. Environmental Health Service.

For primary bibliographic entry see Field 5G.
W76-04367

ARIZONA RULES AND REGULATIONS FOR SEWERAGE SYSTEMS AND WASTE TREATMENT WORKS.
Arizona State Dept. of Health, Phoenix.
For primary bibliographic entry see Field 5G.
W76-04368

CALIFORNIA WATER POLLUTION CONTROL LAWS.
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5G.
W76-04369

REQUIREMENTS AND RESPONSIBILITIES OF THE STATE WATER RESOURCES CONTROL (REGULATIONS FOR IMPLEMENTATION OF THE ENVIRONMENTAL QUALITY ACT OF 1970).
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5G.
W76-04370

COLORADO WATER QUALITY CONTROL ACT.
Colorado Dept. of Health, Denver.
For primary bibliographic entry see Field 5G.
W76-04371

COLORADO REGULATIONS FOR THE STATE DISCHARGE PERMIT SYSTEM.
Colorado Water Quality Control Commission, Denver.
For primary bibliographic entry see Field 5G.
W76-04372

COLORADO WATER QUALITY STANDARDS.
Colorado Water Quality Control Commission, Denver.
For primary bibliographic entry see Field 5G.
W76-04373

COLORADO STANDARDS FOR THE DISCHARGE OF WASTES.
Colorado Water Pollution Control Commission, Denver.
For primary bibliographic entry see Field 5G.
W76-04374

COLORADO REGULATIONS FOR EFFLUENT LIMITATIONS; TREATMENT WORKS SITE APPROVAL REGULATION; STORM SEWER DISCHARGE REGULATIONS.
Colorado Water Quality Control Commission, Denver.
For primary bibliographic entry see Field 2G.
W76-04375

HAWAII ENVIRONMENTAL QUALITY LAW.
Hawaii State Office of Environment Quality Control, Honolulu.
For primary bibliographic entry see Field 5G.
W76-04376

KANSAS UNDERGROUND STORAGE REGULATIONS.
Kansas State Board of Health, Topeka.
For primary bibliographic entry see Field 5G.
W76-04377

KANSAS WATER POLLUTION CONTROL LAWS.
Kansas State Board of Health, Topeka. Div. of Enviornmental Health.
For primary bibliographic entry see Field 5G.
W76-04378

KANSAS WATER QUALITY CRITERIA.
For primary bibliographic entry see Field 5G.
W76-04379

MICHIGAN LIQUID INDUSTRIAL WASTE DISPOSAL ACT.
For primary bibliographic entry see Field 5G.
W76-04380

MICHIGAN OIL SPILLAGE REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-04381

MICHIGAN CLEANING AGENTS REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-04382

MONTANA REGULATION ON WATER POLLUTION FROM LIVESTOCK FEEDING.
Montana Board of Health and Environmental Sciences, Helena.
For primary bibliographic entry see Field 5G.
W76-04383

NEBRASKA ENVIRONMENTAL PROTECTION ACT.
Nebraska State Dept. of Environmental Control, Lincoln.
For primary bibliographic entry see Field 5G.
W76-04384

INLAND WETLANDS: TECHNICAL DEFINITIONS DIRECTED TOWARD EMERGING POLICY ALTERNATIVES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W76-04389

HOW TO DISPOSE OF MANURE AND STAY OUT OF COURT,
For primary bibliographic entry see Field 5E.
W76-04435

AMENDING THE WILD AND SCENIC RIVERS ACT.
House of Rep Conference Rep No. 93-1645, 93d Cong 2d Sess., Dec. 19, 1974. 8 p.

Descriptors: *Wild River Act, *Federal government, *Legislation, *Wild rivers, *National resources, Governments, Rivers, Water law, Legal aspects, Bodies of water, United States, Conservation, Running waters, Inland waterways, Mississippi River, Surface waters, Navigable rivers, Resources, Costs.
Identifiers: *Wild and Scenic Rivers Act, *Lower St. Croix River Act.

A Congressional conference committee has recommended that the following rivers or segments thereof be studied to determine whether they should be added to the National Wild and Scenic Rivers System: the American and Tuolumne, California; An Sable and Manistee, Michigan; Cahaba and West Fork of the Sipsey Fork, Alabama; Colorado, Colorado and Utah; Kettle and Upper Mississippi, Minnesota; Wisconsin, Wisconsin; Illinois, Oklahoma, John Day and South Fork Owyhec, Oregon; Shepaug, Connecticut; Nolichuckey, Tennessee and North Carolina; Clark Fork, Snake and Sweetwater, Wyoming; and Big Thompson, Cache la Poudre, Conejos, Elk, Encampment, Gunnison, Los Pinos, Piedre, Lampa, and Dolores, Colorado. The committee adopted language providing for a st period ending October 2, 1979, for the ab rivers, except that the period for the Dolores end January 3, 1976. An authorization ceilin $2,175,000 was set for the study of the design rivers. The conferees further agreed to amend Lower St. Croix River Act of 1972 by increasi $19,000,000 the authorization for the acquisi and development of land along the segment o river which is to be administered by the Secre of Interior. (Schilling-Florida)
W76-04437

MODIFYING SECTION 204 OF THE FLO ING CONTROL ACT OF 1965.
House of Rep Comm. on Public Works, Rep 93-1483, 93d Cong, 2d Sess, Nov. 19, 1974. 16

Descriptors: *Multiple purpose projects, *Fe government, *Legislation, *Flood co *Oregon, Water, Water law, Legal aspects, U States, Local governments, Governm Governmental interrelations, Floods, C Reservoirs.
Identifiers: *Flooding Control Act of 1965.

The House Committee on Public Works recommended passage of a bill (5,3537) to m section 204 of the Flood Control Act of 1965 purpose of the bill is to authorize modificati the Willow Creek Project in Oregon which become necessary subsequent to the origina ject authorization. The authorized plan consi a multiple purpose reservoir on Willow C together with limited downstream channe provement. During post-authorization studi was determined that the most practicable p for flood control would be a storage res without the channel improvement. Accord the authorized plan has been modified to pro reservoir of the same capacity but with incr flood control storage capabilities. The supply storage and channel improvement sions have been deleted. The recreation de ment and fish and wildlife purposes have reduced along with irrigation storage. Enac of this legislation will result in no additional the government. A special report of the C Engineers is included in this public (Schilling-Florida)
W76-04438

TO EXPAND THE INDIANA DUNES NATI LAKESHORE (HR 3571).
Hearing--Subcomm. on National Parks Recreation--Comm. on Interior and Insul fairs, House of Representatives, 93rd Co 2d Session, June 17, 1974. 292 p.

Descriptors: *National lakeshore, *Conser *Federal government, *National parks, resources development, Water conser Legal aspects, Legislation, Industries, management(Applied), Water policy, Wate tion, Water pollution control, Water law, quality, Water quality control, Recreation, resources, Water conservation, Organiz Agencies, Fish conservation, Fishing, resources, Protection, Indiana.
Identifiers: *Indiana Dunes National Lakes

Considered here are proposed amendment act establishing the Indiana Dunes N Lakeshore. The proposed amendments wo vide for the addition of approximately 523 to the lakeshore. The Subcommittee on N Parks and Recreation received statemen testimony from sixty-four witnesses in representatives of conservation groups g in favor of the proposed amendmen representatives of industries generally opp the proposed amendments. The subcommit received a statement from the Departmen Interior opposing enactment of the p amendments on grounds that the additon land to the lakeshore is neither of natio

ance nor necessary for the fulfillment of the shore's primary purpose. Furthermore, there xisting demands for funds to acquire areas al- y authorized in the National Park System. sey-Florida)
-04439

RM KING MOUNTAIN (PUMP STORAGE NT).
primary bibliographic entry see Field 5G.
-04440

MITS OF ACTIVITIES IN NAVIGABLE ERS OR OCEAN WATERS.
s of Engineers, Washington, D.C.
primary bibliographic entry see Field 5G.
04441

IONAL POLLUTANT DISCHARGE MINATION SYSTEM.
ronmental Protection Agency, Washington,

rimary bibliographic entry see Field 5G.
04442

IANCE PROCEDURES IN EFFLUENT DELINES AND STANDARDS.
ronmental Protection Agency, Washington,

rimary bibliographic entry see Field 5G.
04443

ER QUALITY AND POLLUTANT SOURCE ITORING.
ronmental Protection Agency, Washington,

rimary bibliographic entry see Field 5G.
04444

S MANUFACTURING POINT SOURCE EGORY--PROPOSED EFFLUENT LIMITA- S GUIDELINES AND STANDARDS OF ORMANCE AND PRETREATMENT DARDS.
onmental Protection Agency, Washington,

rimary bibliographic entry see Field 5G.
04445

E COASTAL ZONE MANAGEMENT PRO- M.
nal Oceanic and Atmospheric Administra- Vashington, D.C.
l Reg (8546-48 (1975), 3 p.

iptors: *Coordination, *Inter-agency ration, *Project planning, *Administrative es, *State governments, Standards, Land Coasts, Management, Water, Communica- Programs, Federal government, Administra- cisions.
iers: *Coastal Zone Management Act of

n regulations have been promulgated for the nentation of cited provisions of the Coastal Management Act of 1972. Early in the pment of its state program, each state agen- uld contact all relevant Federal agencies in these regulations, or determined by the istrator of the National Oceanic and At- eric Administration, for the purpose of ar- g for the participation of that Fedral agency development of the state program. ghout the development of the state program, ate and relevant Federal agency should in contact. Furthermore, state programs be submitted to the Administration for to insure compliance with criteria bed in the Act. The regulations also provide preparation of a draft environmental im- pact statement by the Administrator if the state program appears to comply with the criteria of the Act, and for the submission of such statement to each relevant Federal agency for review and comment. The Administrator shall publish his final approval or disapproval of the state programs in the Federal Register. (Segall-Florida)
W76-04446

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY (EFFLUENT LIMITATIONS AND GUIDELINES).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-04447

ANADROMOUS FISHERIES CONSERVATION DEVELOPMENT AND ENHANCEMENT.
National Marine Fisheries Service, Washington, D.C.
40 Fed Register 6786-87 (1975), 2 p.

Descriptors: *Commercial fishing, *United States, *Anadromous fish, *Projects, Grants, *Fisheries, Great Lakes, Spawning, Oceans, Environment, Streams, Fish, Wildlife, Recreation, Harvesting, Marketing, Construction, Facilities, Resources, Research, Development, Real property, Safety.
Identifiers: *Anadromous Fish Conservation Act.

Pursuant to the Anadromous Fish Conservation Act, the Secretary of the Interior and the Secretary of Commerce have proposed revisions to administrative procedures of Part 401 of Title 50, Code of Federal Regulations. The purpose of these proposed rules is to govern the granting of federal assistance to eligible states for projects relating to recreational fisheries and commercial fisheries. The rules prohibit the financing of specified projects and require that projects be completed with reasonable promptness. Also all projects are subject to federal inspection. Provisions governing record keeping are proposed, as well as provisions for determining patent rights in any inventions or discoveries resulting from work under project agreements entered into pursuant to the Act. (Segall-Florida)
W76-04448

PREPARATION OF ENVIRONMENTAL STATEMENTS - GUIDELINES.
Agricultural Stabilization and Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-04449

CIVIL WORKS PROJECTS: LAKESHORE MANAGEMENT.
Corps of Engineers, Washington, D.C.
39 Fed Reg 43399-404 (1974), 6 p.

Descriptors: *Water resources development, *Lake shores, *Environmental control, *Environmental engineering, *Management, Regulation, Administrative agencies, Water resources, Water quality Water pollution control, Recreation, Public lands, Public access, Public benefits, Public health, Safety, Indian reservations, Federal jurisdiction, Federal Water Pollution Control Act, Projects, Adoption of practices, Conservation, Lakes.

The Department of the Army, acting through the Corps of Engineers, herein proposes the policy, practice and procedure to be followed by all Corps of Engineers field operating agencies in connection with the protection of desirable environmental characteristics of Civil Works lake projects, and the restoration of shorelines where degradation has occurred through private exclusive use. The latter category, however, excludes any lake project lands where application of the proposed procedures would result in an infringement of existing Indian rights. The Corps desires to establish and maintain acceptable fish and wildlife habitats for all lakes under its jurisdiction and to assure the public safety of all those who use lake waters to which the Corps holds an easement. The proposal includes preparation of a Lakeshore Management Plan for all Corps lake projects where private recreation facilities exist, but a plan will not be required for new lakes or completed projects where no private facilities exist. The Lakeshore Management Plan also provides for: (1) lakeshore allocation; (2) public recreation area regulation; (3) prohibited access areas; and (4) public participation in the formulation and preparation stages. (Welch-Florida)
W76-04450

SUSQUEHANNA RIVER BASIN COMMISSION - REVIEW OF PROJECTS.
Susquehanna River Basin Commission, Mechanicsburg, Pa.
39 Fed Reg 41973-76 (1974), 6 p.

Descriptors: *Project planning, *River basin commissions, *Interstate commissions, *Administrative agencies, *River basin development, River basins, River regulation, Rivers, River systems, Interstate rivers, Inter-agency cooperation, Inter-basin transfers, Water resources development, Legal aspects, Programs, Projects, Water policy, Administration, Federal project policy, Jurisdiction, Maryland, New York, Pennsylvania.
Identifiers: *Susquehanna River Basin Commission, Susquehanna River Basin.

To implement the program and planning system of the Susquehanna River Basin Commission the proposed rules set forth the purposes and scope of review, application procedures and hearing procedures for the review of any projects affecting the water resources of the Susquehanna River Basin. The rules were adopted and made effective June 1, 1975. These rules provide that no person, association, corporation or other non-governmental entity shall construct or operate any project affecting the resources of the basin prior to review and approval of the Commission of the project. While setting forth procedures for application and review of the proposed projects, the rules also provide for development of 'agreements of understandings' between the Commission and the various agencies of the signatory states, Maryland, New York, and Pennsylvania. These agreements may provide for joint review of projects or allow permits issued by signatory agencies to be considered as Commission approval if issued pursuant to an agreement. Review by the Commission is not required for any project which, prior to this effective data, has been issued a permit by a signatory party allowing completion through the project's final construction phase. (Welch-Florida)
W76-04451

OIL AND HAZARDOUS SUBSTANCE LIABILITY.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-04452

RUBBER PROCESSING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-04453

WATER QUALITY STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-04454

ATLANTIC BLUEFIN TUNA, PROPOSED 'THREATENED STATUS'.
Fish and Wildlife Service, Washington, D.C.
40 Fed Reg 14767-68 (1975), 2 p.

Descriptors: *Commercial fish, *Atlantic Ocean, *United States, *Fish conservation, *Fish, Fishing, Investigations, Canada, Recreation, Wildlife, Data collections, Management, Fisheries, Conservation, Jurisdiction, Boats, Environment, Spawning.
Identifiers: *Atlantic bluefin tuna, *Endangered Species Act of 1973.

The status and welfare of the Atlantic bluefin tuna stocks have been the subject of discussion in recent years, domestically and internationally. Although the data now available are inadequate to positively determine the status of these stocks, they convincingly indicate that adult Atlantic bluefin tuna are substantially depleted in number from previous years. Because of this depletion, the Director of the National Marine Fisheries Service, in consultation with the Director of the United States Fish and Wildlife Service, has issued a notice of proposed determination, pursuant to the Endangered Species Act of 1973, that the Atlantic bluefin tuna is a threatened species and that it be added to the threatened species list under Part 17, Subchapter B of Chapter I, Title 50 of the Code of Federal Regulations.
W76-04455

ATLANTIC BLUEFIN TUNA (THREATENED SPECIES--FISH).
National Oceanic and Atmospheric Administration, Washington, D.C.
40 Fed Reg 14777-78 (1975), 2 p.

Descriptors: *Commercial fishing, *International waters, *Standards, *Fish conservation, *Management, Marine animals, Conservation, United States, Jurisdiction, Nets, Wildflife, Facilities, Tagging, Export, Regulation, Fish, Federal jurisdiction.
Identifiers: *Atlantic bluefin tuna, Angling, Purse seining.

The Department of Commerce has proposed that the Atlantic bluefin tuna be listed as threatened species. In anticipation of and in the event that the Atlantic bluefin tuna is so listed, the Director of the National Marine Fisheries Service proposes to establish these regulations concernin the taking of Atlantic bluefin tuna. The regulations specify the total annual catch quotas, by purse seining and by other method. They also propose that it be made unlawful to take certain Atlantic bluefine tuna under a specified size. Other provisions govern allowable incidental takings and open and closed seasons for different methods of taking. Finaly, general requirements for reporting and tagging are proposed. (Segall-Florida)
W76-04456

STATE V. YELSEN LAND CO., INC. (TITLE TO TIDELANDS).
216 S E 2d, 876-879 (SC 1975), 4 p.

Descriptors: *South Carolina, *Boundary disputes, *Ownership of beds, *High water mark, *Judicial decisions, Boundaries(Property), Low water mark, Legal aspects, Shores, Water law, State governments, Common law, Water rights, Tides, Tidal waters, Navigable waters, Atlantic Ocean, Water levels, Real property.

South Carolina brought an action against claimants to certain tidelands to settle title to the tidelands. The grants by which claimants' predecessors obtained title to the lands described the boundaries to be a 'a small inlet', 'the Atlantic Ocean', a 'sound or creek', and the 'waters of Charleston Harbor'. The Supreme Court of South Carolina held that the State is presumed to be the owner of the tidelands. In the absence of specific language either in the grant or upon the plat, showing that is was intended to convey land below the high water mark, the grant would only convey land to the high water mark. Furthermore, since the grants did not convey the tidelands, claimants could not assert title based on certain South Carolina possession statutes. (Nursey-Florida)
W76-04457

GEORGIA WATER QUALITY CONTROL ACT.
Ga Code Ann, sec 17-503, 17-505, 17-510, 17-511, 17-512, 17-516.1, 17-518, 17-521.2, 17-528.1 (Supp 1974), 10 p.

Descriptors: *Georgia, *Administrative agencies, *Water quality standards, *Water pollution control, Water, Water law, Legal aspects, Legislation, Governments, State governments, Water pollution, Water pollution sources, Pollutants, Wastes, Waste treatment, Abatement, Penalties(Legal), Water pollution treatment, Water policy.
Identifiers: *Georgia Water Quality Control Act, *Effluent limitations, Point sources, Non-point sources(Pollution), Hazardous substances(Pollution), State policy.

Under the Georgia Water Quality Control Act, the State Water Quality Control Board may conduct research on methods to prevent and control pollution, cooperate with and enter into agreements with other governmental units on water quality matters, and establish or revise standards for the purity of waters within the state. Representative provisions of the Act include: (1) it shall be unlawful to use any water of the State for the disposal of sewage or other wastes, except in compliance with rules and regulations established under this Chapter; (2) permits are required for construction or modification of sewage or waste disposal systems, and for the discharge of pollutants from point sources or non-point sources; (3) effluent limitations may be required as a condition in permits issued for the discharge of pollutants; (4) such permits shall have a fixed term not to exceed five years, and may be renewed pursuant to the procedures set forth in this Chapter; (5) the Director of the Division of Environmental Protection may require operators or facilities which result in the discharge of pollutants to undertake certain monitoring, recording, and reporting activities; and (6) the Department of Natural Resources is authorized to expend funds for water and sewage treatment facilities to serve planned communities certified as eligible for State development assistance. (Schilling-Florida)
W76-04458

GROUNDWATER USE ACT OF 1972, AMENDMENTS.
Georgia Code Ann, sec 17-1101 through 17-1115 (Supp 1974), 9 p.

Descriptors: *Georgia, *Groundwater, *Water users, *Administrative agencies, *Legislation, Governments, State governments, Surface waters, Aquifers, Water, Water law, Water supply, Legal aspects, Penalties(Legal), Permits, Regulation, Wells, Water wells, Well regulations, Water resources, Groundwater resources, Aquifer management.
Identifiers: *Georgia Groundwater Use Act of 1972, Injunctive relief, Administrative regulations.

Under the Groundwater Use Act of 1972, the Environmental Protection Division of the Department of Natural Resources shall prepare proposed regulations containing such of the provisions included in this Chapter as the Division finds appropriate concerning the use of groundwater. A permit obtained from the Division shall be required for use of groundwater in excess of 100,000 gallons per day. Such permits shall be issued without a hearing if such water is not consumptively used. In other cases, hearings and appeals shall be conducted in accordance with the Executive Reorganization Act of 1972 and the Administrative Procedures Act. Factors to be c sidered by the Division in making permit decisi are included in this Chapter, as are provisions c cerning the duration, renewal, and transfer of p mits, and the use of water pending issuance of p mits. In certain circumstances of the Division m seek an order enjoining violations of this Chap The Division may also issue emergency ord when an emergency situation is found to ex This Chapter shall not apply to persons u water for agricultural purposes or pou processing purposes, and shall not change modify existing law with respect to surface wat (Schilling-Florida)
W76-04459

WATER RECREATION ACT OF 1973.
Georgia General Assembly, Atlanta.
Georgia Code Ann, sec 17-1201 through 17-1 (Supp 1974), 3 p.

Descriptors: *Georgia, *Water sp *Recreation facilities, *Boating, Water, W law, Legal aspects, Legislation, Governme State governments, Penalties(Legal), Admini tive agencies, Damages, Natural resou Bodies of water, Bonding, Recreation, Recrea demand, Regulation.
Identifiers: *Georgia Water Recreation Ac 1973.

The Georgia General Assembly has found massive water-related recreational events cause considerable damage to natural resourc improperly handled. Furthermore, the incre popularity of water-related recreation will br parallel increase in the number and intensit such events. Therefore, the General Assembl declared that events of this type must be regu so as to insure proper handling and mini damage to natural resources. For the purpo this Chapter, unless the context clearly re otherwise, 'Department' means the Departme Natural Resources, and 'Water event' mean advertised event likely to attract 5000 or more ple onto State waters other than lakes. The pe sponsoring a water event must provide a bond the department not to exceed $10,000 issued surety company authorized to transact busin the State. This shall be the only bond require said water event, and the department shall b sole judge as to the performance. Nothing i Chapter abrogates any existing rights under gia law entitling a person to bring a civil actio damages to person or property. (Schilling-Flo
W76-04460

WATER SUPPLY QUALITY CONTROL.
Georgia Code Ann., sec. 88-2603, 88-2603. 2603.2, 88-2605.1, 88-2611, 88-2613, 88-2614. 2615.1 (Supp. 1974).

Descriptors: *Georgia, Water quality, * quality control, *Water supply, *Legislation, governments, Local governments, Governm interrelations, Governments, Water, Wate Legal aspects, Penalties(Legal), Water st Regulations, Water management(Applied), resources, Water works, Potable water, Flo tion.
Identifiers: *Water supply quality control.

The 'Water Supply Quality Control' chapter Georgia code gives the Board of N Resources additional powers and duties co ing water supply quality control. Included, others, is the power to establish water quality dards, to issue certificates covering the ope of public water supply systems, to collect disseminate information concerning water in the State, to adopt rules and regulations g ing the installation and operation of water systems, to deal with other governmental u matters concerning water supply quality, require the flouridation of potable public supplies in incorporated communities. Ho

tical subdivisions may choose by referendum remove themselves from the fluoridation uirement. No water authority shall be required omply with the fluoridation provisions unless State has made funds available to cover the of necessary equipment, the installation eof, and a six-month supply of necessary nicals. Civil penalties may be imposed for ation of the provisions of this Chapter. illing-Florida)
5-04461

STAL INDUSTRIAL WATER AUTHORITY YORK (OWNERSHIP OF SUBMERGED D ADJACENT TO HOUSTON SHIP CHAN-).
SW2d, p 494-503 (Court of Civil Appeals of s, 1975). 10 p.

criptors: *Texas, Erosion, *Ownership of , *Judicial decisions, *Boundaries(Property), dary disputes, Common law, Water law, nent domain, State governments, Local rnments, Legal aspects, Navigable waters, gable rivers, Beds under water, Seashores, water mark, Low water mark, Bodies of r, Bank erosion, Water rights, Accre- Legal aspects), Real property.
tifiers: *Coastal waters, *Submerged lands.

tiff landowner brought suit against defendant al water authority to determine ownership of erged land. Plaintiff received title to property estion by general warranty deed in which one dary of the proprty was described as the r's edge of the Houston Ship Channel'. After onveyance the water's edge moved inland erging a portion of plaintiff's land. The al authority contended that the submerged was lost to plaintiff and had become property e State of Texas. On appeal the Court of Civil als mentioned the common law rule that , due to erosion, a river comes to occupy land ously dry, the owner loses title to that land. ever, the court held the better rule to be that e lands are privately owned and bordering on shore, or an arm thereof, or other navigable rs, the mere fact that a portion of such lands ne submerged does not deprive the owners of o the land so long as the boundaries can be nably identified. (Nursey-Florida)
04462

RY V. SCHNEIDER (ACTION BY OWNERS LAKE PROPERTY TO ENJOIN MAIN- ANCE OF DAMS ON PROPERTY OWNED EFENDANTS).
.E. 2d, p 143-145 (Fifth District Appellate of Illinois, 1975). 3 p.

iptors: *Earth dams, *Flooding, *Illinois, d damage, Backwater, Dam construction, control, Drainage districts, Lakes, Judicial ons, Penalties(Legal), Water spreading, , Water law, Legal aspects, Damages,

fiers: *Water courses.

efendants erected an earthen dam on their nd which raised the level of an existing lake, hich, following a period of heavy rains, the flooding of hundreds of acres of plain- and. The plaintiffs filed a complaint asking e dam be opened and the water level of the e maintained at sea level elevation. The trial so ordered. Shortly thereafter, the inter- filed their petition to intervene together notions to set aside the decreee and to s the plaintiff's complaint. The major con- s of the intervenors were that the decree allow a portion of the lake to be drained, epriving them of its use; the relief sought cause irreparable damage to their interests; e decree would result in an assessment to rom a sewer drainage district in violation of ier court decree. The trial court granted the petition to intervene but denied the motions to set aside the decree and to dismiss the complaint. On appeal from this decision, the Appellate Court affirmed, finding that adverse effects on intervenors' interest were not a basis for denying plaintiffs their legal right to alter an illegal condition. (Hoffman-Florida)
W76-04463

SPRINGFIELD MARINE BANK V. POLLUTION CONTROL BOARD (APPEAL FROM DENIAL OF VARIANCE FROM BAN ON FURTHER CONNECTION OF SANITARY DRAINAGE OUTLETS TO SEWER).
327 N.E. 2d. p 486-492 (Fourth District Appellate Court of Illinois, 1975). 7 p.

Descriptors: *Illinois, *Sewage disposal, *Economic justification, *Environmental sanitation, Water pollution control, Public health, Judicial decisions, Permits, Legal aspects, Sewage, Sewage treatment, Legal review, Water, Water law, Land, Land development, Land use.
Identifiers: *Sewer connections.

Petitioner is the trustee of an Illinois land trust, the beneficial interest of which is in a joint venture. The business involves the purchase, platting, and development of real estate for residential purposes; and the sale of the unimproved lots. Petitioner was unable to obtain a permit to connect its sewage drainage outlet to a sewer because of a ban on further connections by the Environmental Protection Agency (EPA). A variance from that ban was denied by the Pollution Control Board and the petitioner appealed. Petitioner asserted it was led by an EPA letter to believe that the ban was only temporary. In addition, petitioner had been granted a conditional permit to construct the subdivision sewers but not to use them. As a result of the letter and conditional permit, petitioner procured a million dollar loan, two thirds of which was used to procure other land to develop. Because of these facts, petitioner contended that the Board's decision was arbitrary and unreasonable. The court affirmed the decision, however, holding that the Board's finding, that the economic hardship to the trust did not outweigh harm to the public environment if variance was granted, was adequately supported by the evidence. (Hoffman-Florida)
W76-04464

SPRINGFIELD MARINE BANK V. POLLUTION CONTROL BOARD (APPEAL FROM DENIAL OF VARIANCE FROM BAN ON FURTHER CONNECTIONS OF SEWER OUTLETS TO SEWER).
327 NE 2d, p 492-494 (Fourth District Appellate Court of Illinois, 1975). 3 p.

Descriptors: *Illinois, *Sewage disposal, *Water pollution control, *Public health, *Judicial decisions, Environmental sanitation, Legal aspects, Permits, Sewerage, Sewage treatment, Sewage disposal, Legal review, Overflow, Overburden, Costs, Sewers, Municipal water.
Identifiers: *Sewer taps.

In July 1972, the Environmental Protection Agency imposed a ban on new connections to the sanitary sewers in the southwest Springfield area because of sewage overflow problems. Petitioner, trustee of an Illinois land trust, filed with the Pollution Control Board for a variance from the sewer tap ban in December 1973. He asserted that the beneficiary of the trust, a development company, had been led to believe that the ban was only temporary. Furthermore, the company had been granted a conditional permit to construct the subdivision sewers but not to use them. This had caused the company to stockpile over a half million dollar's worth of building supplies necessary to construct the sewers. The Board, nevertheless, denied the permit resulting in this appeal. The appellate court affirmed, holding that the Board's finding that the economic hardship to the trust did not outweigh the harm that might befall the public if a variance were granted was not contrary to the manifest weight of evidence. While the court recognized that petitioner would suffer losses, they were not found to be sufficient to outweight possible harm from sewage overflows. (Hoffman-Florida)
W76-04465

LEASE PROPERTIES, INC., V. SHINGLETON (ACTION FOR DAMAGE AND INJUNCTIVE RELIEF FOR ALLEGED WRONGFUL CLOSING).
212 S.E. 2d, p 683-685 (Court of Appeals, North Carolina, 1975). 3 p.

Descriptors: *North Carolina, *Easements, *Drainage, *Surface runoff, Legal aspect, Judicial decisions, Surface drainage, Overland flow, Watercourses(Legal aspects), Penalties(Legal), Water law, Water, Drainage effects, Drainage water, Streams, Riparian rights, Riparian land, Obstruction to flow.
Identifiers: *Dominant land, *Servient land, Injunctive relief.

Plaintiff sought damages for the alleged wrongful closing of a drainage ditch by the defendants and requested an injunction requiring the defendants to reopen the ditch. In its complaint, plaintiff alleged ownership of an easement by implication across the defendants land for drainage purposes. Alternately, plaintiff argued that defendant's land was servient to plaintiff's dominant land. Evidence offered by the defendants demonstrated that their land was higher than plaintiff's land, and that there was very little water running through the ditch until the plaintiff paved a large portion of its land. From judgement in favor of plaintiff, defendant appealed. The Court of Appeals affirmed, finding that there was no evidence of any diversion of surface water by the plaintiff. The Court noted that while individual cannot divert water from its natural course so as to damage another, he may accelerate and increase its flow. As long as the drainage results along the natural watercourse the servient proprietor may not complain, even though natural barriers on the higher land have been cut down and the flow of water both accelerated and increased. Thus, the paving of the dominant land by plaintiff did not affect the duty owned by defendant, the servient landowner. (Hoffman-Florida)
W76-04466

NEWARK V. NATURAL RESOURCE COUNCIL, DEPT. OF ENVIRONMENTAL PROTECTION (ACTION TO REVIEW MAPS PUBLISHED BY STATE AGENCY TO INDICATE STATE OWNERSHIP OF RIPARIAN LANDS).
336 A2d p 46-54 (Superior Court of New Jersey, 1974). 9 p.

Descriptors: *New Jersey, *Grasslands, *Riparian land, *Topographic mapping, Mapping, Ecology, Legal aspects, Cross-sections, Land tenure, Land use, Real property, Judicial decisions, Water, Water law, Legal review, Riparian rights, Topography, Land classification, State governments.
Identifiers: *Uplands, Certification.

The Natural Resource Council was directed by State statute to undertake title studies and surveys of the meadowlands throughout the State, and to determine and certify those lands which it finds are state-owned lands. Upon completion of each separate study and survey, the Council was to publish a map clearly indicating those lands designated by the Council as state-owned. When the maps were published they contained three categories: upland, areas not claimed by the state; riparian, areas claimed by the state; and hatched, areas which may be subject to possible claims by the state. This action was a consolidated appeal seeking summary judgement that the hatched

areas used on the maps were not authorized by the statute, since they did not clearly indicate those lands to which the State claimed title, and those which the State did not. The court granted the summary judgement and ordered the Council to prepare and publish a new overlay clearly indicating the State's riparian claim for each map of the areas designated as hatched. In so holding, the court found the use of hatched-marked areas transformed the legislative intent of unequivocal notice into an ambiguity which was both regressive and unfair. (Hoffman-Florida)
W76-04467

SIBSON V. STATE (APPEAL BY OWNERS OF SALT-MARSH FROM DENIAL BY SPECIAL BOARD OF PERMIT TO FILL SALT-MARSH).
336 A.2d, p 239-243 (Supreme Court of New Hampshire, 1975). 5 p.

Descriptors: *Eminent domain, *Salt marshes, *Lanfills, *Judicial decisions, Property value, Constitutional law, Economic impact, Costs, Permits, Environmental effects, Regulations, Marshes, Marsh management, Habitats, Real property, Wildlife management, *New Hampshire, Ecology, Land use, Land reclamation.
Identifiers: Ecological assets, State police power.

In 1968, when plaintiffs purchased a tract of saltmarsh, there was no statute requiring a permit to fill in the land. In 1970 the definition of marshland was amended by statute and a permit requirement instituted. When plaintiff applied for a permit, the board denied the request, finding plaintiffs' land to be a valuable ecological asset of the seacoast area that would be irreparably damaged by the proposed landfill. On appeal plaintiffs argued that this denial rendered their saltmarsh economically useless and therefore constituted a taking. They relied on a U.S. Supreme Court case that declared compensation to be due a landowner when a regulation destroys all or substantially all of his property's value. The court rejected this argument, holding that an owner has no unlimited right to change the essential natural character of his land in order to use it for purposes for which it is unsuited in its natural state and which injure the rights of others. Consequently the denial of the permit was a valid exercise of the state police power and did not constitute a taking. (Hoffman-Florida)
W76-04468

WATER RESOURCES DEVELOPMENT ACT OF 1974.
PL 93-251; 88 Stat. 12, U.S. Code Cong. and Admin. News, p 14-47, 1974. 34 p.

Descriptors: *Water resources development, *Water works, *Water supply development, *Government supports, Rivers and Harbors Act, Legislation, Water control, Water utilization, Water conservation, Water policy, Water allocation(Policy), Research and development, Comprehensive planning, Alternate water use, Area redevelopment, Resources, Potential water supply, Legislation, Multi-purpose projects.
Identifiers: *Water Resources Development Act, Flood Control Act.

This legislation authorizes the Secretary of the Army, acting through the Chief of Engineers, to take numerous and varied actions related to water resources development across the nation. The Act authorizes the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and other purposes. Title I of the Act presents all of the authorized projects, most of which are closely connected with river basin programs already underway across the nation. Title I also contains numerous amendments to existing legislation, such as the Flood Control Acts and the Rivers and Harbors Acts, necessary to allow implementation of newly authorized projects. Title II provides $764 million in appropriations for the prosecution of a comprehensive plan of development for specified river basins under the jurisdiction of the Secretary of the Army. (Hoffman-Florida)
W76-04469

WATKINS V. COBB COUNTY COMMISSION (DAMAGE CAUSED BY SEWER OVERFLOW INTO CONDOMINIUM).
217 SE 2d 298-304 (Ga. Ct. App. 1975). 7 p.

Descriptors: *Obstruction to flow, *Georgia, *Judicial decisions, *Sewerage, *Overflow, Legal aspects, Negligence, Eminent domain, Local governments, State governments, Permits, Construction, Sewage, Sanitary engineering, Waste water disposal, Storm drains.
Identifiers: *Nuisance(Legal aspects), Sovereign immunity.

Plaintiff landowners brought an action against defendants county commission and a land developer for damage caused to plaintiffs' land by overflow from a storm sewer system. Plaintiffs contended that defendant developer, while making a tie-in from its condominiums to the county sewage system, caused a blockage of the system resulting in the overflow. The trial court granted summary judgement in favor of the county and plaintiffs appealed. The Georgia Court of Appeals held that the maintenance of the sewage system was a county function for which the county could not be held liable in negligence; nor could the county be held liable on a nuisance theory since the condition was promptly abated. Finally, the court held that the county could not be held liable on a theory of 'taking' plaintiffs' property without compensation in that county authorities had not been shown to be responsible for the taking not to ratify it. (Nursey-Florida)
W76-04470

STATE V CONSOLIDATED COAL CO (STATUTORY PROHIBITION AGAINST DEPOSITION OF SEDIMENT IN PUBLIC WATERS BY STRIP-MINING HELD DENIAL OF DUE PROCESS).
335 NE2d 403-14 (Harrison County Ct, Ohio 1974). 12 p.

Descriptors: *Sedimentation, Standards, *Ohio, *Constitutional law, *Strip mines, Legislation, Penalties(Legal), Legal aspects, Water law, Deposition(Sediments), Sediment distribution, Regulation, Water pollution control, *Water quality standards, Environmental effects, Stripmine wastes, Judicial decisions.
Identifiers: Criminal penalties, *Due process.

Defendant coal company was charged with criminal violation of a state statute prohibiting the deposition of sediments in public waters by those engaged in strip-mining activities. At trial, defendant contended that the statute was not only so vague and imprecise, as to fail to state ascertainable standards of guilt necessary for criminal conviction, but also in violation of due process, since defendant would be unable to carry on its business if it was required to prevent the natural occurrence of sedimentation. Plaintiff State, however, argued that because of defendant's expertise in this area, defendant understood the meaning of the charges brought, even if the wording of those charges was somewhat vague and imprecise. The State also argued that the statute did not violate due process or constitute an abuse of legislative authority since it was enacted to prevent an important problem--environmental degredation. The Harrison County Court of Ohio rejected the States' contentions, striking down the statute as unconstitutional for vagueness, and in violation of due process. In addition, the court found improper the statute's broad delegation of authority to the chief of the Division of Reclamation. (Hoffman-Florida)
W76-04471

YOUNG V ETHYL CORP (DAMAGES CAUS BY LOSS OF VALUABLE SALT WATER BR BECAUSE OF INJECTION AND PRODUCT WELLS ON SURROUNDING PROPERTY).
521 F2d 771-75 (8th Cir. 1975). 5 p.

Descriptors: *Arkansas, Mineralogy, *Injec wells, *Bromine, *Adjacent land owners, Indu infiltration, Judicial decisions, Common Drainage, Seepage, Reservoirs, Na resources, Land tenure, Reasonable use, Mi Land resources.
Identifiers: *Mineral rights, *Production wells

Plaintiff landowner sought an injunction damages or an accounting for defendant corp tion's forcible removal of valuable minerals beneath plaintiff's land by means of injection production wells on surrounding corpor owned property. The trial court dismissed complaint on the grounds that the common rule of capture precluded relief. That rule, terpreted by the Arkansas Supreme Court, that the drainage of valuable minerals beneath a tract does not consistute a cause tion. The Court of Appeals reversed the court's decision, finding that the Arkansa terpretation of the capture rule did not encon a situation when minerals beneath adjoining were forced to migrate by means of injection located on another's property. The court reviewed applicable state law to determine the Arkansas Supreme Court would probab terpret the capture rule under these facts. It f that the capture rule would be applicable where the drainage or seepage of val minerals was a natural result of the tapping common reservoir, not when it was the res artificially induced movement. Therefore, defendents had unlawfully interfered with tiff's vested property right, the case was rema to the trial court to determine appropriate (Hoffman-Florida)
W76-04472

CONSERVATION COUNCIL V COSTA (DEVELOPER'S FILLING ACTIVITY OF LANDS A VIOLATION OF FEDERAL W POLLUTION CONTROL ACT).
398 F Supp. 653-76 (ED NC 1975). 24 p.

Descriptors: *Federal Water Pollution C Act, *North Carolina, *Marinas, *Dre *Environmental effects, Coastal struc Recreation facilities, Permits, Construction, cial decisions, Pollutants, Legal aspects, rights, Land tenure, Navigable waters, quality control.
Identifiers: *Environmental impact statemen

Defendant developer had undertaken a dr project of his plan to construct a marina o Head Island. As a result of the dredging, p environmental groups brought this action s permanent injunctive relief. Plaintiffs also to have the court require: the restoration dredging area to its natural conditi reprocessing of the dredging permit in acco with National Environmental Policy Act (N standards; and the filing of a permit applicat the developer for the deposit of pollutant waters of the United States. The U.S. Court, for the Eastern District of North Ca refused to grant immediate injunctive relief ing that to do so would adversely affect the interest. Instead, the court ordered the Corps of Engineers to prepare and file an en mental impact statement (EIS) in accordanc NEPA regulations. If upon the issuance of t it is found that the marina will have unacce adverse effects on the environment, appr injunctive relief could then be granted. Ho because the developer's filling activities v the discharge requirements of the Federal Pollution Control Act, the court did ord developer to immediately apply for th propriate permit authorizing its discharge ties. (Hoffman-Florida)

04473

)D CONTROL PROJECTS AND DROUGHT RGENCIES.
Code Ann, Sec 17-8-1 through 17-8-7 (1973),

iptors: *Utah, *Flood control, *Droughts, d plains, Construction, Floodwater, Basins, ns, Flood damage, Easements, Right-of- Bridges, Storm water, Eminent domain, Pol- abatement, Canals, Lakes, Taxes, Real pro- Appropriation, Precipitation(Atmospheric), .

fiers: *Flood channels, Obstructions, Natu- nnels.

ection of the Utah Code enumerates the s of county commissioners in flood and it relief projects. A board of county com- ners may contract with the United States for nstruction of any flood control project ed to abate or control flood waters within unty. A board may also contract to maintain lood control projects and may acquire ease- and rights of way to relocate public roads or s if necessary. The state engineer shall have ty of distributing the waters of flood control t and operating it at the expense of the coun- olved. Two or more counties may enter such ect jointly. A board of county commis- may remove any obstacle from any natural ls within the county and may provide for nstruct new channels to carry away flood . If necessary, the board may obtain ease- and rights of way by right of eminent . It may also provide for the protection and flood channels and present flood plains the county. Finally a board may, at any g, declare that an emergency drought exists county, and appropriate relief funds. -Florida)
1474

ARES I V. BRANNAN SAND AND EL COMPANY (UPSTREAM PROPERTY R'S POSSESSION OF NATURAL AGE EASEMENT OVER DOWNSTREAM RTY).
d, 652-56 (Colorado Court of Appeals, p.

tors: *Colorado, *Drains, *Drainage, ction to flow, *Adjacent land owners, Rural areas, Easements, Channels, Con- n, Repairing, Maintenance, Surface Subsurface waters, Gravels, Percolating Civil law, Culverts, Depression beaches, Recreation facilities, Shores, Excavation.

's, owners of higher land, brought action defendant, owner of lower land, to enjoin nt from obstructing the natural flow of om the higher land onto the lower. The dis- rt granted injunctive relief and required nt to provide and maintain a drain. Defen- eed that plaintiff's land was the dominant t and that his lower land was the servient t with respect to surface drainage, but d that the rule granting a natural ease- er downstream land for drainage of water nly in rural areas where the land existed atural undisturbed state. The Colorado f Appeals held that the rule applied to eas as well, and to areas where the land n an altered state. Therefore the injunc- upheld and defendant made responsible l clearance of the former channel or, if a rse were elected, for intial construction Plaintiffs, however, were deemed respon- replacement, repair and maintenance of nel, and received reasonable right of ac- such purposes. (Segall-Florida)
76

GENERAL AGRICULTURE CORPORATION V. MOORE (REPEALED STATUTE'S EFFECT NIL ON PRIORITY IN APPROPRIATION OF WATER WHICH IS A CONSTITUTIONALLY VALUABLE RIGHT).
534 P2d, p 859-64 (Montana, 1975), 6 p.

Descriptors: *Montana, *Surplus water, *Water rights, *Prior appropriation, *Adjudication procedures, Appropriation, Priorities, Legislation, Distribution, Beneficial use, Ditches, Right-of-way, Drains, Canals, Aqueducts, Reservoirs, Regulation, Streams, Judicial decisions.

Plaintiff filed a petition seeking to appropriate surplus waters from an adjudicated stream. While the action was pending an act was passed by the Montana legislature which substituted a new procedure for the appropriation of water rights and repealed the section of the former act under which plaintiff has instituted its action. Plaintiff filed an amended complaint, but on motion by defendants, claimants to rights in the same water supply source in which plaintiffs were claiming, the district court dismissed the amended complaint on grounds that plaintiff's action was abated by repeal of the former act. The Montana Supreme Court, in reversing, hleld that plaintiff had an existing right to the use of water for a useful or beneficial purpose and that under the 1972 Constitution such right was recognized and confirmed. (Segall-Florida)
W76-04477

ADMINISTRATION OF THE FLOOD PLAIN REGULATIONS.
Nebraska Rules and Regulations for L B 893 (1967), 3 p.

Descriptors: *Nebraska, *Floodways, *Structures, *Permits, *Flood plains, Floods, Jurisdiction, Encroachment, Agriculture, Livestock, Grazing, Recreation, Wells, Floodwater, Bridges, Railroads, Pipelines, Foundations, Hydrostatic pressures, Water table, Floodproofing, Sewage, Stormwater, Maintenance, Construction, Application methods, Investigations.
Identifiers: Fences, Alterations, Obstructions, Drainway.

These Nebraska Rules and Regulations deal with the administration of flood plains. They provide that the program initiated by the Commission for the delineation of Commission floodways shall follow a priority list of areas to be studied and establish the order in which studies shall be made. Within the limits of the Commission Floodway, the Commission shall delineat 'Selected Floodways'. The limits of a Selected Floodway shall be where the extent of permitted encroachment would not raise the estimated level of the flood of 100 year frequency in excess of one foot. Only the uses specified in these Regulations are permitted within Selected Floodways; and regulations are also set forth for the use of lands lying outside the Selected Floodways but within the Commission Floodway. Plans for the location, alteration or construction of any artificial obstruction in the Commission Floodway shall be submitted to the Commission for review and action. An applicant who has been denied a permit by the Commission may apply for a formal hearing. Also set forth are rules governing written requests for investigation of obstructions. (Segall-Florida)
W76-04478

HANAHULI ASSOCIATION, LTD (HIGHWATER SEASHORE MARK).
532 P2d 397-98 (Ha 1975), 2 p.

Descriptors: *High water mark, *Hawaii, *Boundaries(Property), *Shores, *Waves(Water), Seashores, Judicial decisions, Boundary disputes, Legal aspects, Classification, Pacific Ocean.

Corporation applied to register title to real property and the land court ruled that the relevant seaward boundaries of appellee's land were located at the intersection of the shore and the upper reaches of the wash of the waves. On appeal, the Supreme Court of Hawaii affirmed, holding that the phrase 'highwater mark at seashore' has been properly construed to mean the upper reaches of the wash of the waves. (Segall-Florida)
W76-04479

MEHL V. PEOPLE EX. REL. DEPT. OF PUB. WORKS (DAMAGES CAUSED BY INCREASED DRAINAGE DUE TO FREEWAY CONSTRUCTION).
532 P2d 489-95 (Cal 1975), 7 p.

Descriptors: *Highway effects, *California, *Easements, *Drainage, *Drainage systems, Culverts, Damages, Construction, Rain, Right-of-way, Industries, Investment, Storm drains, Ditches, Discharge(Water), Landscaping, Maintenance, State government, Judicial decisions.

Plaintiff County brought action against defendant landowners to determine the amount of compensation due for a drainage easement. The landowners cross-complained against the State for inverse condemnation for partial loss of their property resulting from the State's construction of a highway which had increased drainage across their property. The Trial court entered judgement for the landowners on their cross complaint and the State appealed, contending that the landowners were estopped from claiming damages because their predecessors in interest had waived any right to claim damages when they granted the state adjacent property for highway construction. Furthermore, the landowners had failed to file their claim within the statutory period of limitations. The Supreme Court of California held that the landowners' predecessors in interest had not known of the State's intention to build the drainage system and, therefore, had not intended to waive the claim asserted now by the successors. The Court also found that the claim was timely made because the limitation period did not begin to run until the landowners became aware of the drainage flow. In addition, the evidence supported a finding of taking of property by the State. The judgement as to damages, however, was reversed and remanded for a new trial. (Segall-Florida)
W76-04480

SHAUB V. DIST. CT. (DETERMINATION OF WATER RIGHTS TO MAINSTREAM INCLUDING RIGHTS TO ALL OF ITS SOURCES).
539 P2d 277-80 (Idaho 1975). 4 p.

Descriptors: *Idaho, *Water rights, *Tributaries, Streams, Jurisdictions, Ditches, Diversion, Beneficial use, Irrigation, Seepage, Trespass, Springs, Appropriation, Canals, Adjacent land owners.

Plaintiff brought action for a writ of review of an adjudication that he was in contempt of court for violation of a previously issued injunction. That injunction had ordered plaintiff to refrain from diverting more than ten miner's inches of water from a main stream known as the 'Mendini Tunnel'. In the original adjudication, the owner of a large ranch adjacent to plaintiff's ranch claimed that a seepage stream which formerly flowed into the main stream had been diverted by plaintiff for his own use. Plaintiff admitted using the water but asserted that it had always flowed into his ditch and was not part of the main stream. The district court found that the seepage stream was a natural tributary of the main stream; hence, when defendant diverted the water from its natural flow he was guilty of trespass. On petition for review, the Supreme Court of Idaho held that an adjudication of water rights to a main stream also adjudicated rights to all tributary streams; furthermore, the waste water made available to defendant in the

original decree was the flowage of two springs separate from the disputed stream at issue. The judgement of the district court was affirmed. (Segall-Florida)
W76-04481

CENTRAL COLORADO WATER CONSERVANCY DISTRICT V DENVER (RELATION BACK TO VALID 'FIRST STEP' (INTENTION) IN WATER APPROPRIATION TO MEASURE PRIORITY).
539 P2d 1270-73 (Colo. 1975). 4 p.

Descriptors: *Colorado; *Water storage, *Water rights, *Judicial decisions, *Appropriation, Water districts, Maps, Reclamation, Beneficial use, Diversion, Reservoirs, Water supply, Application methods, Investigations, Water, Priorities, Water allocation(Policy).

Plaintiff water conservancy district filed applications for conditional decrees as to water storage rights. The district court held for the objectors, City and County of Denver and Public Service Company of Colorado. The district contended that the filing of maps and statements alone was sufficient to warrant the granting of a conditional water decree, and that even if the filings alone did not suffice, the record showed that the district had taken the required 'first step' necessary for appropriating water. The Colorado Supreme Court first defined an appropriation as 'the intent to take accompanied by some open, physical demonstration of the intent, and for some valuable use', and then held that the filing alone was not sufficient to establish the first step since the district had not revealed its intention through an open demonstration on the land. Furthermore, the record did not show that the district had done anything sufficient to provide outsiders with notice of an intention to appropriate water and convert it to beneficial use. Therefore, the district court's judgement was affirmed. (Segall-Florida)
W76-04482

NEBOSHONE ASS'N, INC. V. STATE TAX COMMISSION (RIPARIAN OWNERSHIP INCLUSIVE OF SOIL UNDER WATER BUT NOT WATER OR FISH THEREIN).
227 NW 2d., 358-69 (Michigan Ct. App. 1975). 12 p, 1 tab.

Descriptors: *Assessments, *Property values, *Access routes, *Michigan, *Taxes, Riparian land, Navigable rivers, Appraisals, Value, Legal aspects, Judicial decisions, Government finance, Riparian rights, Water rights, Real property, Economics, Fishing, Recreation.

Plaintiff landowners appealed a determination of the State Tax Commission which greatly increased the assessed valuation of plaintiff's land. The land in question, which was in a wooded, unpopulated area, had a navigable river that ran through the middle of it. Because of the river, the Commission in assessing the property, placed a valuation on the river frontage. Plaintiffs objected, contending the Commission's action was unjustified since the river was owned and used by the public. The court agreed that riparian owners do not own the water or the fish in the water. The court went on to find, however, that the public's rights did not prevent plaintiffs from having unlimited access to the water. Thus, since plaintiffs were free to fish and use the water, the Tax Commission was justified in placing valuation on the river frontage in assessing the land.
W76-04483

SAMBS V. BROOKFIELD (PROPER WATER DRAINAGE FROM BRIDGE REQUIREMENT TO PREVENT ICE COLLECTION).
224 NW 2d, 582-93 (Wisc 1975). 12 p.

Descriptors: *Wisconsin, *Negligence, *Accidents, *Highway icing, Drainage engineering, Judicial decisions, Legal review, Drainage water, Backwater, Surface water, Excess water, Freezing, Ice, Roads, Penalties(Legal), City planning, Natural flow, Legal aspects, Drainage effects, Hazards, Safety, Risks.

Plaintiff automobile passenger brought this suit against defendant city for damages for injuries arising out of an automobile accident that was allegedly caused by the city's failure to provide adequate drainage culverts along the highway. The plaintiff contended that this inadequate drainage caused water to backup on the highway where it froze; and that the resulting accumulation of ice helped cause the accident. From a decision by the trail court that the city was 30% responsible for plaintiff's injuries, the city appealed. The city contended that the accumulation of ice was a 'natural' event, and that under a state statute, the city could not be found negligent unless the ice accumulation had existed for three weeks. The city also contended that the accident was caused by the driver's negligence, and not by the ice accumulation. The Wisconsin Supreme Court affirmed, however, finding that since the city was aware that the highway had improper drainage, any water that backed up as a result of the inadequate drainage was an 'artificial' event. The Court also found that sufficient evidence had been presented to support the trail court's finding as to the city's culpability. (Hoffman-Florida)
W76-04484

STATE DEPARTMENT OF NATURAL RESOURCES V. PANKRATZ (DETERMINATION OF RIGHT TO SAND BAR OFF ISLAND IN NAVIGABLE STREAM CONTROLLED BY HIGH WATER MARK BOUNDARY).
538 P2d, 984-94 (Alas 1975). 11 p.

Descriptors: *Alaska, *Federal-state water rights conflicts, *Accretion, *Gravels, *High water mark, Boundaries(Property), Ownership of beds, Federal jurisdiction, Land tenure, Legal aspects, Judicial decisions, Legal review, Riparian land, Dredging, Excavation, Islands, Contracts, Banks, Patents.
Identifiers: *Vegetation test(High water mark), Gravel bars.

Defendant landowner obtained title to an island that was situated directly in front of his riverfront property. Soon afterward the State of Alaska contracted with defendant for defendant to remove gravel clogging one channel of the river. Due to defendant's gravel bailing operation, a gravel bar began to emerge contiguous to the upstream end of defendant's island. Subsequently the State sought to acquire title to the gravel bar by means of an action to quiet title. After the trail court found in favor of the defendant, the State appealed to the Alaska Supreme Court. The State contended that the gravel bar had not emerged above the annual mean high water mark, and that even if it had, it was the result of the defendant's own actions, and not the result of natural accretion. As to the high water mark, the Court found that federal law was controlling, since title to the island stemmed from a federal patent. In this case, the Court found that the 'vegetation test' was applicable in determining the high water mark, and that defendant had satisfied this test by the use of expert testimony. As to the accretion issue, the Court found that no evidence had been introduced showing that the accretion had occurred as a result of improper bailing of gravel by the defendant. The trial court's decision was affirmed. (Hoffman-Florida)
W76-04485

STATE V. MICHELS PIPELINE CONSTRUCTION (NO LIABILITY FOR GROUND WATER USE FOR BENEFICIAL PURPOSE EVEN IF IT INTERFERES WITH ANOTHER'S USE UN UNREASONABLE HARM IS INVOLVED).
217 NW 2d 339-51 (Wisc. 1974). 13 p.

Descriptors: *Water table, *Wisc *Groundwater, *Percolating water, *Reas use, Subsurface waters, Water law, Legal as Water rights, Competing uses, Water tra Sewers, Judicial decision, Legal review, Co law, Relative rights, Excess water(Soils), G water resources, Saturated soils.
Identifiers: *Correlative rights.

In order to install a sewer line, defendan struction company had to remove water fr soil so that a sufficient depth could be ob Because of this dewatering of the soil, p State sough injunctive relief, alleging th ground water table had been seriously re causing hardship and damage to neighbori and well owners. After the trial court dis the complaint for failure to state a cause of plaintiff appealed to the Wisconsin S Court. The Court agreed with the trial co previously controlling case law held tha ference with ground water did not const cause of action. The Court noted, howev this common law rule has been severely cri and that two other rules have developed c ing rights in percolating waters. These ru (1) the reasonable use rule, which recogni unreasonable interference with ground wa cause of action; and (2) the correlative rig which holds that a landowner cannot extra than his share of the water. The Court reje three rules, however, adopting the Restate Torts rule which is a mixture of the reasona and correlative rights rules. The trial cou sion was then reversed and remanded to de if the defendant's actions constituted a c action under the Restatement rule. (Ho Florida)
W76-04486

OMERNICK V. STATE (LEGISLATIVE E MENTS AS PROTECTIVE OF PUBLIC R IN WATER).
218 NW 2d, p. 734-44 (Wisconsin, 1974). 11

Descriptors: *Judicial decisions, *Wis *Legislation, *Diversion, *Water rights, tion of flow, Water management(Applied) utilization, Irrigation water, Industrial Legal review, Legal aspects, Constitutio Navigable waters, Non-navigable Streams, Water users, Water demand governments.
Identifiers: Statutory construction, Equal tion.

Defendant property owner had been conv statutory violations for diverting water w permit from a neighboring stream to an i pit on his own land. On appeal, defend tended: (1) that the statute was not appli nonnavigable streams; (2) that the statute plicable only to stream-to-stream diversi that the statute was not intended to cover water; and (4) that the statute denied the de equal protection. The Wisconsin Suprem affirmed the decision, rejecting all of def contentions. The Court found that the should be so constructed as to achieve the tive intent. Thus, even though the statute to navigable streams, the general purpos statute made it clear that the statute was ap to all streams. The Court also found that interpretation of the statute negated th dant's second and third contentions. As protection, the Court found that a valid sisted for requiring a permit to divert wat rigation purposes, even though no per required for industrial uses. (Hoffman-Flo
W76-04487

ULION V. STATE WATERWAYS COM-ION (DAMAGES CAUSED BY EROSION M SMALL CRAFT HARBOR CONSTRUC- RENDERING COMMISSION LIABLE).
W2d, p. 828-33 (Michigan Court of Appeals, 6 p.

iptors: *Michigan, *Beach erosion, *Shore ction, *Land use, Navigable waters, Land gement, Judicial decisions, Legal review, rs, Coastal engineering, Legal aspects, nt domain, Non-structural alternatives, an land, Riparian rights, Water law, Water , Penalties(Legal), Property values, Real rty, Contracts.
fiers: *Navigational servitude doctrine.

e request of defendant waterways commis- plaintiff property owners gave permission to te to enter their property for the purpose of remedial action to prevent further erosion reline property caused by the construction nall craft harbor. Plaintiffs brought this ac- r damages when they discovered that the remedial action consisted of dumping tons ged rocks along the entire stretch of the ne. Plaintiffs contended that the property of the land had been substantially reduced access to the water had been made virtually ible. The trial court dismissed the com- however, finding that the written permis- iven by plaintiffs precluded any recovery. urt of Appeals reversed, finding that plain- id not give permission for the extensive ions that were actually undertaken. The went on to find that the navigational ser- doctrine, which would recognize no com- ion rights in riparian or littoral property where the government is involved, was not ble in this case since shore land had ac- been taken to improve navigation. an-Florida)
488

V. FORD (NO TAKING OF RIPARIAN S).
S 2d, p. 721-24 (Supreme Court, 1975). 4 p.

tors: *New York, *Condemnation, *Real y, Mapping, *Appraisals, Eminent domain, l decisions, Legal aspects, Riparian land, mnation value, Constitutional law, Reser- Value, Legal review, State jurisdiction, upply, Administrative agency.
ers: *Procedural requirements.

rk City had mapped riparian property situ- to seventy miles below the Pepacton ir. This mapping was done so that a fair al price could be determined concerning sation in a condemnation suit that had itiated by the city. Petitioner landowner, ned land located ninety-five miles below rvoir, brought action seeking a judgement the appellant water supply board to map rian premises. Petitioner contended that 's actions constituted a compensable taking roperty. Appellants moved to dismiss the nt, contending that the trial court did not authority to order the board to condemn er's property. The court rejected this con- however, and granted the requested relief. al, the Supreme Court remanded the case, hat the trial court had decided the case on ts before it had given appellant a chance to the petition. Although the trial court did risdiction, appellant should have been ve to answer. (Hoffman-Florida)
89

V. ABRAMS (NAVIGATION LAW IN-ABLE TO TIDEWATERS).
2d., 138-41 (1st D.C. 1975). 4 p.

ors: *Boundary disputes, *New York, aters, *Navigable waters, *Tides, Legal aspects, Bodies of water, Boats, Navigation, Water law, Regulation, Jurisdiction, State jurisdiction, Legislation, Governments, Water rights, Local governments, Judicial decisions.

Plaintiff state sought to charge defendant with violation of Navigation Law s. 164 which prohibits defacing or removing of identification or serial numbers on outboard motors. Defendant was arrested on the tidewaters bordering and lying within the boundary of Suffolk County. Defendant claimed that the Navigation Act did not apply to such tidewaters while plaintiff claimed such tidewaters were not exempt from the application of the Navigation Act. The District Court of Suffolk County dismissed the action upon defendant's motion, holding that the Navigation Law did not apply to tidewaters bordering on or lying within the boundaries of Nassau and Suffolk counties. (Welch-Florida)
W76-04490

NEW YORK CITY HOUSING AUTHORITY V. COMMISSIONER OF ENVIRONMENTAL CONSERVATION DEPARTMENT (MORATORIUM CLAUSE OF TIDAL WETLANDS ACT).
372 NYS 2d, p 146-52 (Supreme Court, 1975). 7 p.

Descriptors: *Land use, *Wetlands, *Legislation, *New York, *Eminent domain, Permits, Appropriation, Real property, Compensation, Zoning, Natural resources, Drainage, Land management, Properties, State governments, Regulation.
Identifiers: *Tidal wetlands.

The New York City Housing Authority brought suit attacking the applicability of the Tidal Wetlands Act to land acquired by the city under power of eminent domain. It also contended the Act was unconstitutional, thus challenging the power of the state environmental commissioner to prohibit alterations of tidal wetlands. The Supreme Court of Queens County treated the suit as one for declaratory judgment. It held that: (1) the housing authority was a separate entity, distinct from the state; (2) that land acquired by the city under the power of eminent domain was not exempt from the Act; (3) that the legislature had a valid purpose in formulating a comprehensive system of land use regulations for preservation of the wetlands; and (4) that a moratorium on alterations in effect for less than two years was not unreasonable. Thus the commissioner's actions under the Act's moratorium clause did not amount to an unconstitutional taking of property without just compensation. (Segall-Florida)
W76-04491

FORDHAM OPERATING CORP. V. WESTCHESTER COUNTY (DOMINANA EASEMENT FOR DRAINAGE OF SURFACE WATER NOT INCLUSIVE OF ARTIFICIAL CONCENTRATION OF WATER THAT WOULD HAVE DRAINED ELSEWHERE).
370 NYS 2d., 977-896 (Sup. Ct. 1975). 10 p.

Descriptors: *Easements, *New York, *Drainage systems, *Drainage water, *Surface drainage, Surface waters, Drainage practices, Excess water(Soils), Drainage, Water distribution(Applied), Pipes, Legal aspects, Adverse possession, Drainage engineering, Channeling, Damages, Controlled drainage, Surface runoff.

Plaintiff landowner brought action for monetary damages and to enjoin defendant defendant county from continuing to collect and discharge channeled water onto plaintiff's property. Plaintiff's predecessors in title had conveyed a 40 ft.-wide easement across the property to the city of Rye. The city subsequently installed a sewer line. The bed of the easement was transferred to the defendant who constructed a road and a catch basin with drain pipe. At trial, both parties moved for summary judgement, but the Supreme Court of Westchester County held that genuine issues of material fact existed as to whether the defendant had been given permission by the city of Rye to install a drainage pipe and head wall upon the easement, and whether such use of the drainage pipe was so open and notorious as to have put plaintiff on notice as to the presence of an easement. The court further held that one who claims a dominant estate by reason of an easement permitting natural drainage of surface water to the servient estate cannot by artificial means concentrate and discharge surface waters which, if left alone, would drain elsewhere.
W76-04492

MAY V. TORRES (ADJOINING RANCH OWNERS' RIGHTS TO FLOW OF WATER IN A DRAW).
519 P2d 298-300 (NM, 1974). 3 p.

Descriptors: *Beneficial use, *Natural streams, *Permits, *Diversion, *Unappropriated water, Appropriation, Damages, *New Mexico, Surface waters, Grazing, Jurisdiction, Watercourses(Legal aspects), Water permits, State governments, Irrigation, Water rights, Costs, Drainage effects.
Identifiers: Draws, Injunctive relief.

Plaintiff rancher brought suit against defendant neighboring rancher seeking a determination of the respective rights of each to the flow of water in a draw which drained through a portion of defendant's ranch and onto plaintiff's ranch. Plaintiff also asked for an injunction commanding defendant to refrain from diverting more than his share of water from the draw, and damages for losses incurred from defendant's alleged unlawful diversion of water. Both plaintiff and defendant claimed to have made beneficial use of waters flowing down the draw for grazing purposes. The district court dismissed the case because neither party had secured a state permit to use the waters. The Supreme Court of New Mexico, however, found that if this draw does constitute a natural stream, and if there are unappropriated waters therein of which the parties have been making beneficial use, then they are entitled to have their respective rights adjudicated, even though the adjudication would not affect the rights of the State in these waters. The cause was remanded for trial on the issues. (Segall-Florida)
W76-04493

IN RE WATER RIGHTS OF FT. LYON CANAL CO. (CONTRACT RENDERS PRIORITY TO WATERS INFERIOR TO ANOTHER).
519 P2d 954-57 (Colo. 1974). 4 p.

Descriptors: *Water rights, *Priorities, *Jurisdiction, *Reservoirs, *Lakes, Licenses, Irrigation, Contracts, Spring waters, Colorado, Pumping, Prescriptive rights, Construction, Legislation, Appropriation, State jurisdiction.
Identifiers: Non-tributory water, Priority decrees, Water judge.

In 1954 appellee, a canal company owning land upon which a lake is located, entered into an agreement with appellants whereby appellants were granted a license to lay pipes and to pump water from the lake to their land for irrigation purposes. In 1959 appellants obtained a decree allowing the withdrawal of five cubic feet of water per second. Subsequently, the canal company applied for a conditional water right in the lake amounting to twenty-five cubic feet per second. Appellants appeared and asked that any rights granted the company be subject to appellants' decree. The court found it had jurisdiction, granted the conditional decree, and ruled that appellants' prior decree was junior to the water right granted the canal company. On appeal appellants contended that a water judge does not have jurisdiction over non-tributory water, and that priorities awarded in any year are junior to those awarded in previous years. Furthermore, they claimed the original agreement was invalid because appellee was not

owner of the water. The court rejected all of appellants' contentions and affirmed the decree. (Segall-Florida)
W76-04494

WILBER DEVELOPMENT CORPORATION V. LES ROWLAND CONSTR., INC. (SUBDIVISION STORM DRAINAGE FACILITIES MAY INCREASE FLOW OF SURFACE WATER IF NO DAMAGE CAUSED FROM WATER COURSE CHANGE).
423 P2d. 186-90 (Wash. 1974).

Descriptors: *Natural flow, *Storm structure, *Washington, *Judicial divisions, *Drainage water, Legal aspects, Water law, State governments, Local governments, Penalties(Legal), Surface waters, Surface drainage, Drainage systems, Water control, Channels, Construction, Land development.

Plaintiff corporate landowner brought an inverse condemnation action against defendant municipality and a land development company for damage allegedly caused to plaintiff's land by a storm drainage facility constructed by defendants. Plaintiff contended that the storm drainage facility discharged more water onto its land than would have naturally reached it, with resulting damages. Defendants, however, argued that no new sources of water had been diverted and that the water table under plaintiff's land remained the same as before the facility was constructed. The Washington Supreme Court held that a municipality is ordinarily not liable for consequential damages caused by increased surface water flow if the damages arise wholly from changes in the character of the surface produced in the ordinary and regular course of municipal expansion. Plaintiff could recover damages only if it could show that municipality had collected surface water by an artificial channel and discharged it onto plaintiff's land. (Nursey-Florida)
W76-04495

GROFF V. CIRCLE K CORP. (WATER DAMAGE RESULTING FROM GRADE CHANGE BY ADJOINING LAND OWNER).
525 P2d 891-93 (NM Ct. App. 1974). 3 p.

Descriptors: *Artificial water courses, *New Mexico, *Judicial decisions, *Adjacent landowners, *Drainage water, Legal aspects, Water law, State governments, Penalties(Legal), Natural flow, Drainage effects, Construction, Land development, Drainage systems, Surface waters, Surface drainage, Paving, Water control, Channels.
Identifiers: *Artificial channels.

Plaintiffs landowners brought an action against defendant corporation for damage caused by surface water discharge onto their property. Plaintiffs contended that defendant's construction of a store and parking lot diverted onto their property drainage which naturally flowed away from it. The New Mexico Court of Appeals held that, although defendant had not used drainage systems to rechannel the water, the manner in which the corporation changed the grade of the land and paved the parking lot created an 'artificial channel' which discharged water onto plaintiff's land. The Court then found defendant responsible for damage caused by this redirected drainage water. (Nursey-Florida)
W76-04496

HOWARD V. CACTUS HILL RANCH CO. (UPSTREAM OWNER'S POSSESSION OF NATURAL EASEMENT ON LAND DOWNSTREAM FOR SURFACE WATER DRAINAGE).
529 P2d 660-62, (Colo. Ct. App. 1974). 3 p.

Descriptors: *Colorado, *Judicial decisions, *Natural flow doctrine, *Drainage water, Classification, Legal aspects, Water law, Common law, State governments, Adjacent land owners, Right-of-way, Easements, Controlled drainage, Drainage systems, Surface drainage, Ditches, Surface waters, Drainage effects.
Identifiers: *Nuisance.

Plaintiff downstream property owner brought on action for trespass and nuisance against defendant upstream property owner. Plaintiff contended that defendant had trespassed and created a nuisance by his use of an irrigation ditch along a right-of-way strip on the boundary of plaintiff's land. Defendant, however, argued that the water discharged from the ditch onto plaintiff's property was consistent with the natural and historic drainage of water from the upper land onto the lower land and thus was discharged pursuant to a lawful easement. The Colorado Court of Appeals found the drainage through the right-of-way to be a natural flow. Since plaintiff failed to prove that defendant had made any detrimental change in the natural flow, defendant's discharge of water onto plaintiff's land was presumed pursuant to the natural easement held by upper landowners over lower lands. (Nursey-Florida)
W76-04497

STATE V. YELSEN LAND CO., INC. (STATE PRESUMPTIVE OWNER OF TIDELANDS WITHOUT SPECIFIC INTENT SHOWN TO CONVEY LANDS BELOW USUAL HIGH WATER MARK).
216 SE 2d 876-79 (SC 9175). 4 p.

Descriptors: *Boundaries(Property), *South Carolina, *Judicial decisons, *Ownership of beds, *Boundary disputes, Legal aspects, Water law, State governments, Common law, Navigable waters, Accretion(Legal aspects), Shores, High water mark, Water levels, Tidal waters, Tides.
Identifiers: Coastal waters.

Plaintiff State of South Carolina brought an action against defendants, a land company and a realty company, to determine title to tidelands. Defendants contended that the land grant to their predecessors in title describing the boundary of the property as 'bounded to the North by a small inlet' and to the West 'by a sound or Creek' gave them title to the tidelands. The State claimed the boundary of defendants' property to be defined by the high water mark. After a judgement for the State in the Court of Common Pleas, the South Carolina Supreme Court held that, in the absence of specific language to the contrary, the grant conveyed property to the high water mark only. The State's ownership of disputed tidelands below that mark was affirmed. (Nursey-Florida)
W76-04498

STATE V. GRIFFITH (NECESSARY TO SHOW SPECIFIC INTENT TO CONVEY ANY LAND BELOW USUAL HIGH WATER MARK OF STREAM IN ORDER TO CONVEY TITLE TO ADJACENT TIDELANDS).
216 SE 2d 765-67 (SC. 1975). 3 p.

Descriptors: *High water mark, *South Carolina, *Judicial decisons, *Boundary disputes, *Ownership of lands, Legal aspects, State governments, Water law, Navigable waters, Streams, Comon law, Accretion(Legal aspects), Shores, Water levels, Tides, Tidal waters, Boundaries(Property).

Plaintiff State of South Carolina brought an action against defendant landowner to determine title to certain tidelands. Plaintiff contended that the tidelands were conveyed to his predecessors in title by a grant describing the northerly boundary of the property as a 'Deep Creek', which was ascertained to be a tidal, navigable stream. The State claimed title to all lands below the high water mark. The South Carolina Supreme Court held that, in the absence of any language in the grant signifying a specific intent to convey title to the tidelands general rule that land below the high water ma a navigable stream belongs to the state w apply. (Nursey-Florida)
W76-04499

METROPOLITAN SANITARY DISTRICT UNITED STATES STEEL CORPORAT (ABATEMENT OF WATER POLLUTION LAKE MICHIGAN).
332 NE2d 426-39 (Ill. Ct. App. 1975). 14 p.

Descriptors: *Governmental interrela *Illinois, *Judicial decisions, *Water pol control, *State jurisdiction, Legal aspects, law, Federal government, Local governm Federal jurisdiction, Penalties(Legal), Pe Regulations, Water pollution, Water pol sources, Water quality, Water quality co *Lake Michigan, Lakes, Industrial wastes.

Plaintiff metropolitan sanitary district brou action to abate the pollution of a lake by defe corporation. Defendant moved to dismiss stay any action pending completion of admi tive proceedings before the Environmental P tion Agency (EPA). This motion was denie appeal the Illinois Appellate Court held th doctrine of primary jurisdiction was not appl since the hearings before the EPA concern granting of a permit which would allow defe to continue polluting under certain restri while the state court proceedings involve abatement of the pollution. (Nursey-Florida)
W76-04500

6F. Nonstructural Alternatives

FLOOD HAZARD MAP, FREDERICTON NEW BRUNSWICK, NORTHWEST SHEET
Department of the Environment, (Ontario); and New Brunswick Dept. of Fi and Environmental.
For primary bibliographic entry see Field 7C
W76-04157

FLOOD HAZARD MAP, FREDERICTON NEW BRUNSWICK, SOUTHEAST SHEET
Department of the Environment, (Ontario); and New Brunswick Dept. of Fi and Environment.
For primary bibliographic entry see Field 7C
W76-04158

FLOOD DAMAGE IN FREDERICTION.
Department of the Environment, (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C
W76-04260

ANALYSIS AND SYNTHESIS OF FLOOI TROL MEASURES,
Colorado State Univ., Fort Collins. Dept. Engineering.
For primary bibliographic entry see Field 4.
W76-04308

THE FEDERAL RULE OF ACCRETIO CALIFORNIA COASTAL PROTECTION,
For primary bibliographic entry see Field 6
W76-04338

SAMPLE FLOOD PLAIN ZONING ORDI FOR LOCAL UNITS OF GOVERNMENT.
Minnesota Dept. of Natural Resources, S League of Municipalities, Association of C

Descriptors: *Minnesota, *Flood plain *Land use, *Land classification, *Non-st alternatives, Regulation, Legal aspects,

ning, Land mana ement, Multipurpose pro-
ts, Floodways, Administration, Penal-
(Legal), Decisior making, Boundary disputes,
mits, Building codes, Legislation.

nnesota has prepared a sample flood plain zon-
ordinance that calls for local zoning agencies to
ide flood plains into floodway and flood fringe
as, Generally, the only land uses that will be al-
ed in floodway zones will be those having a
flood damage potential, such as agriculture
parking areas, while flood fringe areas will not
so severely limited. This division should
inate much of the arbitrary decision making
arises when proposed developments are evel-
d on a case by case basis. This sample or-
nce also describes how the local zoning map
uld be established, and lays down procedural
delines to be used in interpreting boundary
utes. Typical permitted uses for floodway and
d fringe areas are also presented. To assure
pliance with the ordinance, landowners must
y for a land use permit before they make any
rations or additions to their property. If the
gnated local agency is satisfied that the
posed changes are consistent with the or-
nce's land use provisions, a certificate of com-
ice will be issued upon completion of specified
edural requirements. (Hoffman-Florida)
-04356

**OD PLAIN MANAGEMENT FOR OREGON
ES AND COUNTIES.**
on Univ., Eugene. Bureau of Governmental
arch and Service.
on Water Resources Board, (Salem), (1971).
2 fig, 2 map.

riptors: *Oregon, *Flood plain zoning, *Land
*Flood plain insurance, *Non-structural alter-
es, Flood protection, Flood damage, Land
gement, Water zoning, Flood ways, Legisla-
Regulation, Reasonable use, Water law,
l governments, Economics, Property values,
its.
ifiers: *Flood protection programs,
onal Flood Insurance Program.

ovide a suitable basis for flood plain manage-
in Oregon cities and counties, all flood prone
should be dlineated into floodway or flood-
ringe districts. Because of their low eleva-
floodway areas will generally be zoned for
uses having a low flood damage potential.
way fringe districts, on the other hand, will
ally be zoned to allow building and other
tructures. Care should be taken by local zon-
encies, however, to make sure that land uses
t unnecessarily restricted, since the courts
shown a tendency to invalidate zoning
tions that deny all reasonable economic use
land. Zoning agencies may nevertheless im-
reasonable restrictions, and the agencies
y enforce such regulations by requiring in-
als to obtain permits before they make any
ions or additions to their flood prone lands.
gh land management programs can do much
uce flood damage, a comprehensive flood
tion program should also include adequate
insurance. Recognizing this, the federal
ment established the National Flood In-
e Program in 1968. This insurance, which is
le only to small business and one-to-four
dwellings, is aimed at providing subsidized
ce rates to present occupants of flood
areas. To illustrate how an overall flood
ement program can be implemented, a sam-
ning ordinance is presented. (Hoffman-
)
357

**ANCE TO AMEND THE BUILDING
OF THE CITY OF GILLETTE, WYOM-**

, Wyoming, City Council Ordinance 43-73
2 p.

Descriptors: *Wyoming, *Building codes, *Flood control, *Construction, Flood plains, Legislation, Permits, Flood plain insurance, Maps, Water zoning, Water management(Applied), Water policy, Flood plain zoning, Design standards, Regulation, Administrative decisions, Adoption of practices.
Identifiers: *Flood management programs.

Ordinance 43-73 amends the building code of the City of Gillette, Wyoming, by adopting by reference, with specified exceptions, the 1975 Uniform Building Code. The ordinance also recognizes that county zoning and building permits are issued by the City-County Planning Office to areas around the city. While zoning regulations are in effect in these areas, there is no building code, and thus little control is exerted over construction techniques. This is of concern to the City of Gillette, since it wants to include these outer areas in the Flood Insurance Rate Map. Therefore, a County Subdivision Regulation is adopted here which will provide some control over construction in these outer flood plain areas. The regulation, which limits the uses which may be made on lands subject to flooding, is viewed as a temporary measure until flood plan management and building code ordinances are adopted. (Hoffman-Florida)
W76-04358

AN ORDINANCE RELATING TO FLOOD PLAIN MANAGEMENT.
Gillette, Wyoming, Ordinance Relating to Flood Plain Management (1975). 2 p.

Descriptors: *Legislation, *Flood protection, *Land use, *Flood plain zoning, *Flood plains, *Legal aspects, Penalties(Legal), Local government, Regulation, Permits, Water law, Flood damage building codes, Flood data, Floodways, Land resources, Water resources, Land development, Water resources development, Water utilization, Water management(Applied), Hazards, Public utilities, Construction, *Wyoming.

The City of Gillette, Wyoming has passed an ordinance relating to flood plain management, significant provisions of which include: (1) a direction to the City Engineer to prepare maps delineating the flood plains and floodways within the city; (2) a prohibition within the floodways of dumping, filling, residential uses, and confining of animals, and of all structures except navigational structures, public water facilities, bridges and utilities; (3) a requirement that all new construction within 'Flood Plain Areas Having Special Flood Hazards' be designed and use materials resistant to flood damage; and (4) a requirement that water and sewage systems be designed to eliminate or minimize infiltration of flood waters. Other sections of the ordinance provide specifically for public nuisances, permits, and penalties. (Nursey-Florida)
W76-04359

MINIMUM REQUIREMENTS FOR FLOOD CONTROL.
Charleston County, South Carolina, Ordinance 170 (1973). 6 p.

Descriptors: *South Carolina, *Legislation, *Flood control, *Flood protection, *Flood plain zoning, Legal aspects, Reglation, Water law, Land resources, Water resources, Land development, Water resources development, Building codes, Land use, Water utilization, Floods, Flood damage, Floodproofing, Floodways, Water management(Applied), Permits, Potable water.
Identifiers: *National Flood Insurance Program.

Representative provisions of this county ordinance dealing with land use in conformance with the National Flood Insurance Program include: (1) all residential construction shall position their finished first floor elevation in accordance with the prescribed elevations for the zone in which they are located; (2) all new construction of non-residential structures shall have the lowest floor elevated to or above the applicable level prescribed for their flood zone; (3) flood proofing of structures will include structural and non-structural engineering techniques which seal structures and keep them free from encroachment of flood water below the prescribed finished first floor elevation; (4) construction is restricted within the extra-hazardous ocean front zones; (5) new or replacement water and sewer systems will be designed, built and located so as to minimize infiltration of flood waters and to avoid impairment during flooding; and (6) all new construction and improvements in the flood zones will comply with the Southern Standard Building Code so as to provide approved anchoring to minimize the possibility of flood and velocity damage. This ordinance was to take effect on November 15, 1973. (Nursey-Florida)
W76-04360

FLOOD PLAIN MANAGEMENT -- FPM-1 AND FLOOD INSURANCE PROGRAM.
Indiana Dept. of Natural Resources, Indianapolis. Information File prepared by Dept. of Nat. Res. (1974). 31 p, 2 photo, 1 fig.

Descriptors: *Administrative agencies, *Building codes, *Indiana, *Flood control, *Flood plain insurance, Flood plains, Legislation, State governments, Governmental interrelations, Management, Regulation, Water policy, Water management(Applied), Zoning, Non-structural alternatives, Comprehensive planning, Flood plain zoning.
Identifiers: *Flood management programs, *Federal Flood Insurance Program.

The Indiana Department of Natural Resources Water Division has made information available in packet form to aid Indiana planning agencies and zoning authorities in developing a comprehensive flood management program. Under the authority of the Flood Plain Management Act, the Indiana National Comission (NRC) has promulgated rules and regulations which can be used to aid local authorities in managing flood hazard areas within their jurisdiction. If these voluntary rules are adopted by communities across the state, it will provide a uniformity of policy necessary to the protection of Indiana's Flood Plains. The formation packet also contains copies of the Indiana 1945 Flood Control Act and the Indiana 1973 Flood Plain Management Act, as well as various rules promulgated by the NRC, a suggested program for flood plain management, and a copy of selected questions and answers concerning the Federal Flood Insurance Program . The importance of this Federal Flood Insurance Proplem has been substantially increased by the 1973 Flood Protection Act which requires that federally financed construction projects be adequately covered by flood insurance. (Hoffman-Florida)
W76-04361

MODEL FLOODWAY ORDINANCE (FLOODWAY REGULATION).
North Carolina General Assembly, Raleigh.
North Carolina, Model Floodway Ordinance (1971). 5 p.

Descriptors: *North Carolina, *Legislation, *Flood control, *Flood protection, *Construction, *Obstruction to flow, Legal aspects, Water law, Penalties(Legal), Local governments, Regulation, Floodways, Flood plain zoning, Floods, Flood damage, Land, Land use, Land resources, Land development, Water resources, Water resources development, Water management(Applied).

The North Carolina General Assembly has enacted a model floodway ordinance empowering local governments to establish floodways and to regulate obstructions in floodways. Representative provisions of the ordinance include: (1) no ar-

tificial obstruction may be placed in any floodway unless a permit has been granted for such artificial obstruction; (2) artificial obstructions already existing in a floodway are not in violation of this ordinance but may not be enlarged or replaced without a permit; (3) the determination to issue a permit for the placement, replacement or enlargement of an artificial obstruction on a floodway will be based on consideration of certain specified effects of the artificial obstruction in creating danger to life and property; and (4) any violation of this ordinance will constitute a misdemeanor. The purpose served by designating certain areas as floodways is to help control floods by preventing obstruction which inhibit flow and increase flood height and damage. (Nursey-Florida)
W76-04362

PROPOSED FLOOD DISTRICT ORDINANCE.
Galveston, Texas, City Council Proposed Amendment to Zoning Ordinance, Chapter 25 (1974). 13 p.

Descriptors: *Texas, *Legislation, *Flood protection, *Building codes, *Flood plain zoning, Legal aspects, Water law, Flood control, Floods, Flood damage, Flood plains, Floodways, Floodproofing, Land, Land use, Land development, Water management(Applied), Regulation, Construction, Local governments, Water supply, Sewage, Drainage systesems.

This proposed ordinance will create two new zoning classifications known as FP-1 and FP-2 to coincide with Flood Plain Area I and Flood Plain Area II on the official zoning district map. Representative provisions include: (1) all new construction in FP-1 shall be elevated to a grade not less than six inches above the base flood elevation; (2) all new construction in FP-2 shall have the lowest floor elevated at least six inches above the base flood elevation or eighteen inches above the natural ground, whichever is higher, and utility and sanitation facilities of non-residential structures shall be floodproofed to the same elevation; (3) all construction, improvements, repairs and developments shall conform to construction requirements prescribed by the ordinance; (4) new or replacement water supply systems shall be designed to eliminate infiltration of flood waters into the system; and (5) new or replacement sanitary sewer systems shall be designed to eliminate infiltration of flood waters into the system or discharges from the system into flood waters. The general purpose of this ordinance is to promote the public health and safety and to reduce losses of life and property caused by flooding. (Nursey-Florida)
W76-04363

FLOOD HAZARD REGULATIONS (AMENDMENT TO THE BUILDING CODE).
Galveston, Texas, City Council, Chapter 26, Section 26-3 (1974). 6 p.

Descriptors: *Texas, *Legislation, *Flood protection, *Flood plain zoning, *Building codes, Legal aspects, Water law, Construction, Floods, Flood control, Flood damage, Flood plains, Floodproofing, Land, Land use, Land resources, Land development, Regulation, Drainage systems, Water supply, Local governments, Water management(Applied).
Identifiers: *National Flood Insurance Program.

In order to entitle city residents to particulate in the benefits received under the National Flood Insurance Program, the City Council of Galveston, Texas, has adopted this ordinance, representative provisions of which include: (1) all new construction or substantial improvements of residential structures will have the lowest floor elevated at least to the level of the 100-year flood in zone A-11 of the special flood hazard area, and at least five feet above the 100-year level in zone V-II; (2) nonresidential construction will have the lowest floot either elevated or floodproofed at least to the 100-year flood level in zone A-II and at least five feet above the 100-year flood level in zone V-II; (3) new construction or substantial improvements to existing structures in special flood hazard areas which are situated on ground the elevation of which is below the 100-year flood level will be elevated on anchored piles or columns to a lowest-floor level at or above the 100-year flood level; and (4) new or replacement water supply and sewer systems shall be designed to minimize the flow of flood waters into the systems and the flow of discharges into flood waters. The Planning Commission will review subdivision proposals to assure that they are consistent with the requirement minimize flood damage. (Nursey-Florida)
W76-04364

AN ORDINANCE REGULATING THE USE OF FLOOD PLAIN AREAS.
For primary bibliographic entry see Field 4A.
W76-04475

ADMINISTRATION OF THE FLOOD PLAIN REGULATIONS.
For primary bibliographic entry see Field 6E.
W76-04478

6G. Ecologic Impact Of Water Development

DEVELOPMENT PRIORITIES IN THE WEST RIVER REGION, NORTH DAKOTA, A SOCIAL ATTITUDE AND COMMUNICATION ANALYSIS,
North Dakota Univ., Grand Forks. Communication Research Center.
For primary bibliographic entry see Field 6B.
W76-04007

THE EFFECT OF THE GOSHEN BAY DIKE ON THE BENTHOS OF UTAH LAKE IN RELATION TO WATER QUALITY,
Brigham Young Univ., Provo, Utah. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-04013

AQUATIC SURVEY OF SELECTED STREAMS WITH CRITICAL HABITATS ON NATIONAL RESOURCES LANDS AFFECTED BY LIVESTOCK AND RECREATION,
Brigham Young Univ., Provo, Utah. Center for Health and Environmental Studies.
For primary bibliographic entry see Field 4C.
W76-04042

INDICATORS OF CHANGE IN THE RECREATION ENVIRONMENT: LAW AND ENVIRONMENTAL PLANNING,
Department of Justice, Washington, D.C. Land and Natural Resources Div.
W. M. Cohen.
Federal Bar J., Vol 33, p 283-295 (1974). 13 p, 49 ref.

Descriptors: *Federal government, *Comprehensive planning, *Recreation, *Environmental effects, *Administrative agencies, Administration, Management, Ecology, Environmental control, Judicial review, Decision making, Constitutional law, Recreation facilities, Social participation, Legal aspects, Coordination, Social aspects, Water law.
Identifiers: *National Environmental Policy Act(NEPA).

A large number of environmental protection statutes have been passed in recent years which require extensive planning. This paper explores the impact these statutes will have with special regard to recreation and recreational planning. The National Environmental Policy Act (NEPA) contains a highly publicized procedural mandat requiring the preparation of an environmental im pact statement to accompany every report o proposals for legislation or other Federal actio significantly affecting the quality of the human e vironment. Highly developed recreation areas ca put great stress on the environment and therefo require environmental safeguards. Set forth a suggested topics and format for an environment impact statement on the development of such area. The legal concept of standing is explored show recent trends, including the expansion what constitutes a litigable interest. This tre should allow increased public involvement in n tional, regional, and community planning. Also e amined are some of the safeguards which gua against administrative arbitrariness. One su safeguard, judicial review, operates by requiri the trial record to show the rationale and basis administrative decision so that the appellate co will know all the facts. (Hoffman-Florida)
W76-04328

THE PROTECTION OF THE ENVIRONME AND WORLD PUBLIC ORDER: SOME RECE DEVELOPMENTS,
Yale Univ., New Haven, Conn. School of Law.
M. S. McDougal, and J. Schneider.
Mississippi Law Journal, Vol 45, p 1085-1 (September, 1974). 40 p. 147 ref.

Descriptors: *Ecosystems, *United Natio *Resource allocation, *Treaties, Conservati United States, Administration, Coasts, Decis making, Organization, Education, Resour development, Natural resources, Oceans, Be Jurisdiction, Governments, Leadership, Ecolog Identifiers: *International cooperation, Inter tional agreements.

This article examines world environmental p cies and resource allocation in terms of inclu and exclusive use. By inclusive the authors m those environmental interests which are shared all nations and which relate to the healthy fu tioning of the earth-space environment as a wh By exclusive they mean those interests that ev state has in promoting its own internal optim order, and which often result in special claims the environment which may or may not con with inclusive interests. The trend is tow greater demands for shifts from inclusive to ex sive competence. State claims to 'patrimo seas' in which they assert the right to exercise clusive competence over natural resource ploitation are illustrative. This trend must reversed, suggest the authors. Future decis about competence over resources should refle high a degree of inclusive enjoyment as poss especially regarding the oceans and seabed. United Nations in particular should encourage initiate programs to change international attit towards resources that are inclusive by na (Parrish-Florida)
W76-04329

SYSTEMS DESCRIPTION OF THE U.S. CO GUARD MARITIME ENVIRONMENTAL P TECTION PROGRAM,
For primary bibliographic entry see Field 5G.
W76-04330

A SURVEY OF REMEDIES (TO WATER P LUTION AND WATER SCARC PROBLEMS).
Stanford Environmental Law Society, Calif.
For primary bibliographic entry see Field 5G.
W76-04331

PRIVATE INFLUENCE ON ENVIRONMEN POLICY: THE CASE OF THE NATIONAL DUSTRIAL POLLUTION CONTROL COUN
State Univ. of New York Coll. at Cortland. D of Political Science.
H. J. Steck.

nvironmental Law, Vol. 5, No. 2, p 241-281 1975). 41 p, 161 ref.

escriptors: *Decision making, *Administrative gencies, *Industries, Research facilities, conomic impact, Land use, Industrial wastes, mprehensive planning, Economics, Governents, Institutions, Leadership, Legislation, lanning, Standards, Resources development, esearch and development, Federal government, perations, Natural resources, Costs, Project anning.
lentifiers: *National Industrial Pollution Control ouncil(NIPCC), *Federal Advisory Committee ct of 1972(FACA).

his article deals with governmental advisory mmittees and their influence on the formation of licy, in the area of environmental law. Governent relies heavily on such committees for exper-se. Often such committees are drawn from the ivate sector, with the inherent danger that the mmittee's advice will be biased. To minimize is danger, the Federal Advisory Committee Act 1972 was passed, requiring diversity in commit-e membership and full disclosure of committee tivities. There are various ways of avoiding mpliance with the Act, as illustrated by the cord of the now defunct National Industrial Pol-tion Control Council. Originally the Council was eated as a consulting body, whose membership as largely composed of heads of the country's ggest corporations. Subsequently, however, it veloped into a powerful lobby for industrial in-rests involved in many levels of government pol-making in the environmental sector. Generally, e article explores a major problem facing en-ronmentalists, that is, whether the environmen-initiatives of Congress will become entangled lost in the federal bureaucracy. An explanation the function of advisory committees as conduits tween the public and private sectors is the cen-l theme. (Parrish-Florida)
76-04346

SE STUDY OF A HYDROELECTRIC DAM: E DICKEY-LINCOLN SCHOOL PROJECT,
ssachusetts Inst. of Tech., Cambridge. Civil gineering Program.
Cooper.
vironmental Affairs, Vol. 3, No. 4, p 707-742 74). 36 p, 95 ref.

scriptors: *Project planning, *Hydroelectric ject licensing, *Dams, *Economic justifica-n, *Environmental effects, Recreation, Boat-, Fishing, Local governments, Ecosystems, lic utilities, Public benefits, Public access, droelectric plants, *Maine, Canada, Flooding, es, Streams, Electric power costs, Electric er demand, Rivers, Regulated flow, Water l fluctuations, Costs.
ntifiers: Dickey-Lincoln Hydroelectric pro-(Maine), Whitewater canoeing, *St. Johns er(Maine), Energy crisis.

s article examines the proposed Dickey-Lin-hydroeclectri project to be located on the er Saint Johns River in Maine, near the adian border. Although once abandoned, this ny Corps of Engineers' project has been reju-ated, because of higher costs of energy and in-sing power demands in the northeast section he country. The Corps' preliminary studies e been subject to much criticism, mainly use what one group regards as a project efit, another labels a detriment. In economic s, if the project is built, the region immediate-ill experience large benefits. First, a construc-boom would result, followed by a sudden drop lower level of benefits than those the area ld experience if the project were not built at Other tradeoffs to be considered include (1) pping wilderness area recreational uses, such hitewater canoeing and stream fishing, for boating and fishing; and (2) deciding between latively small producer of pollution-free renewable, safe power and the relatively 'dirty' nuclear or fossil fuel alternative. (Parrish-Florida)
W76-04347

REQUIREMENTS AND RESPONSIBILITIES OF THE STATE WATER RESOURCES CONTROL (REGULATIONS FOR IMPLEMENTATION OF THE ENVIRONMENTAL QUALITY ACT OF 1970).
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5G.
W76-04370

TO EXPAND THE INDIANA DUNES NATIONAL LAKESHORE (HR 3571).
For primary bibliographic entry see Field 6E.
W76-04439

STORM KING MOUNTAIN (PUMP STORAGE PLANT).
For primary bibliographic entry see Field 5G.
W76-04440

PREPARATION OF ENVIRONMENTAL STATEMENTS - GUIDELINES.
Agricultural Stabilization and Conservation Service, Washington, D.C.
39 Federal Register, Vol 39, No 246, p 43996-44002 (1974), 7 p.

Descriptors: *Environmental effects, *Administration, *Environmental control, Legislation, Regulation, Federal jurisdiction, Decision-making, Administrative agencies.
Identifiers: *Environmental impact statements, *Public hearings, *National Environmental Policy Act.

In order to comply with Council on Environmental Quality guidelines, the Agricultural Stabilization and Conservation Service (ASCS) published proposed guidelines concerning the issuance of environmental impact statements (EIS). This publication prompted public response on a number of topics, including: identification of major actions significantly affecting the environment; actions not requiring preparation of EIS; preparation of EIS; and consultation, review and public involvement concerning various sections of the National Environmental Policy Act (NEPA). These comments were considered by the ASCS before it published its final guidelines. These final guidelines, which are presented in full, encompass numerous aspects of the EIS, including: (1) purpose and authority for the EIA; (2) policy justifications for the issuance of the EIS; (3) implementation of the final guidelines by ASCS; (4) identification of major actions significantly affecting the environment; (5) preparation of environmental statements; and (6) an outline of environmental statement content. Finally, the guidelines set down the procedural requirements for the circulation of the environmental statements. (Hoffman-Florida)
W76-04449

SUSQUEHANNA RIVER BASIN COMMISSION - REVIEW OF PROJECTS.
Susquehanna River Basin Commission, Mechanicsburg, Pa.
For primary bibliographic entry see Field 6E.
W76-04451

ATLANTIC BLUEFIN TUNA, PROPOSED 'THREATENED STATUS'.
Fish and Wildlife Service, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-04455

7. RESOURCES DATA

7A. Network Design

METHODS OF DETERMINING AREAL RAINFALL FROM OBSERVED DATA,
Bureau of Meteorology, Melbourne (Australia).
For primary bibliographic entry see Field 2B.
W76-04130

DATA NEEDS, AQUISITION, AND AVAILABILITY FOR HYDROLOGIC MODELS,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 7C.
W76-04146

GUIDELINES ON SAMPLING AND STATISTICAL METHODOLOGIES FOR AMBIENT PESTICIDE MONITORING.
Federal Working Group on Pest Management, Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-04315

7B. Data Acquisition

A STUDY OF CONTINUOUS WATER QUALITY MONITORING SYSTEMS,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-04006

THE INTERCEPTION PROCESS,
For primary bibliographic entry see Field 2I.
W76-04131

EVAPORATION FROM CATCHMENTS,
Commonwealth Scientific and Industrial Research Organization, Mordialloc (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 2D.
W76-04137

MODEL EVALUATION, TESTING AND PARAMETERS ESTIMATION IN HYDROLOGY,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-04142

DEFORMATION AND FLOW OF BARNES ICE CAP - BAFFIN ISLAND,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W76-04151

NIAGARA RIVER ACOUSTIC STREAMFLOW MEASUREMENT SYSTEM,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
R. A. Halliday, W. M. Archer, and P. I. Campbell.
Technical Bulletin, No 86, 1975. 11 p, 10 fig, 2 tab, 11 ref.

Descriptors: *Streamflow, *Measurement, *Instrumentation, Equipment, Velocity, Electronics, Technology, Stage-discharge relations, Flowmeters, Data collections, Hydraulics, Depth, Ice, Weeds, Inflow, Flow rates, Temperature, *Canada.

Identifiers: Transducers, *Niagara River(Canada).

Work conducted in other countries in the 1960's demonstrated the feasibility of using acoustic velocity measurement devices for determining flow in open channels. Accordingly, a decision was made to install one such instrument, the Westinghouse Leading Edge (LE) Flowmeter, on a large Canadian River where there was a demand for 'real time' streamflow data and where the stage-discharge relationship was affected by backwater. Results obtained would be used to determine the feasibility of operating an acoustic streamflow measurement system under Candian conditions. A flow meter having a 1700-foot (530-metre) long acoustic path was installed in 1971 and, despite some installation and operational problems, is providing accurate streamflow data. The plans for the future include telemetry of the data to users and further calibration of the instrument. (Environment Canada)
W76-04165

LIGHT TRANSMISSION THROUGH SNOW AND ICE,
Department of the Environment, Burlington (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 2C.
W76-04178

APPLICATIONS OF MICROWAVES TO REMOTE SENSING OF TERRAIN,
Radiometric Technology, Inc., Wakefield, Mass.
R. A. Porter.
Available from the National Technical Information Service, Springfield, Va 22161. NASA Contractor Report CR-2581, November 1975. 55 p, 1 fig, 1 tab, 15 ref. NASA NAS 1-13126.

Descriptors: *Remote sensing, *Microwaves, *Terrain analysis, Mapping, *Surveys, Exploration, Instrumentation, Aircraft, Satellites(Artificial), Radar, Radiation, Data processing.
Identifiers: *Survey questionnaires.

A survey and study was conducted to define the role that microwaves may play in the measurement of a variety of terrain-related parameters. The survey consisted of discussions with many users and researchers in the field of remote sensing. In addition, a survey questionnaire was prepared and replies were solicited from these and other users and researchers. The results of the survey, and associated bibliography, were studied and conclusions were drawn as to the usefulness of radiometric systems for remote sensing of terrain. (Sims-ISWS)
W76-04314

DEVELOPMENT OF A SEA-ICE THICKNESS GAGE--AN ATTEMPT TO USE SHEAR WAVES,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2C.
W76-04320

FROM AEROSPACE PHOTOGRAPHS TO FORECASTING AND CALCULATING FLOWS,
G. P. Kalinin.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-13367, $4.50 in paper copy, $2.25 in microfiche. NASA Technical Translation F-16,006, December 1974. 57 p, 10 fig, 2 tab, 42 ref. Translation of 'Ot aerokosmicheskikh snimkov k prognozam; raschetam stoka,' Gidrometeorogich Izd., Leningrad, p 1-41, 1974.

Descriptors: *Remote sensing, *Streamflow forecasting, Aircraft, Satellites(Artificial), *Forecasting, Hydrology, Flow, Runoff, Streams, Streamflow, Watersheds(Basins), Snow cover, Data collections, Data processing, *Aerial photography.
Identifiers: *USSR.

A theoretical basis for using hydrological data obtained by means of remote measurements (from spacecraft and aircraft) was provided. Methods of calculating flow and the characteristics of the snow cover were suggested based on photographs that characterize the dynamics of the hydrological processes that occur on the surfaces of river basins. Problems of experimental investigations leading to new possibilities of analysis and calculation of a number of hydrological elements were posed. The book was intended for hydrological specialists. (Sims-ISWS)
W76-04325

ICE DYNAMICS IN THE CANADIAN ARCHIPELAGO AND ADJACENT ARCTIC BASIN AS DETERMINED BY ERTS-1 OBSERVATIONS,
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W76-04412

7C. Evaluation, Processing and Publication

DERIVATION AND EVALUATION OF RESERVOIR RULE CURVES,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-04014

HYDROLOGIC DATA SUMMARY: CLEARWATER RIVER BASIN, WATER YEAR 1973-1974,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 4C.
W76-04019

SYNTHETIC INPUT DATA TIME SERIES FOR CATCHMENT MODEL TESTING,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.
For primary bibliographic entry see Field 2A.
W76-04144

DATA NEEDS, AQUISITION, AND AVAILABILITY FOR HYDROLOGIC MODELS,
Snowy Mountains Engineering Corp., Cooma (Australia).
J. A. H. Brown.
In: Prediction in Catchment Hydrology. Australian Academy of Science, Canberra, Australia, 1975. p 429-455, 3 tab, 60 ref, append.

Descriptors: *Reviews, *Hydrologic data, *Data collections, *Australia, *Model studies, Sampling, Networks, Data storage and retrieval, Data processing, Meteorological data.

Some of the more general questions concerned with the availability of data for hydrologic models are reviewed; in particular, the sampling problem in space and time, the wide range of data required for some of the modern and sophisticated models, new concepts in data networks, and trends in methods for processing, storing and disseminating the data. The Australian position with respect to the availability and suitability of data for hydrologic models is then summarized. An appendix gives a list of published Australian hydrologic and meteorologic records. (See also W76-04128) (CSIRO)
W76-04146

SURFACE WATER DATA, BRITISH COLUMBIA 1974.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
Water Survey of Canada, 1975, 338 p.

Descriptors: *Hydrometry, *Instrumentation, *Gaging, Data collections, Water levels, Water measurement, *Canada.
Identifiers: *British Columbia, Hydrometric surveys, Stream gages.

Tables are presented containing the results of the hydrometric survey conducted in British Columbia during the year 1974, by the Water Survey of Canada under agreement with the Province of British Columbia. Surface water data on daily water levels or discharges, summaries of monthly and annual data, and descriptive information concerning the gauging stations, are found in the tables. (Environment Canada)
W76-04150

DEFORMATION AND FLOW OF BARNES ICE CAP - BAFFIN ISLAND,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W76-04151

INVENTORY OF CANADAIN FRESHWATER LAKES.
Department of the Environment, Ottawa (Ontario). Inland Waters Directories; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
1973. 34 p, 1 fig, 2 tab, 1 atlas.

Descriptors: *Lakes, *Maps, Surface water, Water storage, *Canada, Statistical methods, *Surveys.
Identifiers: *Atlas, Lake areas, Islands(Lakes).

An atlas of 999 lakes is organized into three sections which contain: (1) index maps for the Atlantic Provinces, province of Quebec, province of Ontario, Prairie provinces, province of British Columbia, Yukon and Northwest Territories showing the location, name and identification number of all lakes with total surface aerea in excess of 100 square kilometers. (2) Individual lake maps in numerical order for the whole of Canada showing the outline of the lake, the islands and other data. (3) A publication 'inventory of Canadain freshwater lakes' which explains procedures for obtaining data, and includes tables showing the grouping of lakes in each region and Canada according to area. (Environment Canada)
W76-04153

GLACIER SURVEYS IN BRITISH COLUMBIA 1970,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W76-04154

NAQUADAT USERS MANUAL,
Department of the Environment, Ottawa (Ontario). Water Quality Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Demayo, and E. Hunt.
1975, 78 p, 55 fig, 7 tab, 12 ref, 9 append.

Descriptors: *Stations, *Water quality, *Data collections, Publications, Information retrieval, *Canada.
Identifiers: *National Water Quality Data Bank(NAQUADAT), *Dictionary, Data bank, *Users manual, Data retrieval.

e development of the National Water Quality
a Bank (NAQUADAT) is described. The struc-
e of the three files making up NAQUADAT -
dictionary, station, and data files are discussed
ata. An outline is given of the steps involved in
water quality data collection process in the
ter Quality Branch. The various types of
ieval available from NAQUADAT are ex-
ned and examples are given. (Environment
ada)
6-04156

OD HAZARD MAP, FREDERICTON AREA,
W BRUNSWICK, NORTHWEST SHEET.
artment of the Environment, Ottawa
tario); and New Brunswick Dept. of Fisheries
Environmental.
, 17 p, 5 fig, 1 tab, 1 map. English and French.

criptors: *Precipitation(Atmospheric),
owmelt, *Flood peak, Flood frequency, Flood
iles, Damages, Ice jams, Food discharge,
ps, Mapping, *Canada.
tifiers: *Flood hazard map, Saint John River,
ericton, *New Brunswick, Flooding
lems, Nashwaaksis Stream, Baker Brook.

map, one of the two flood hazard maps for
Fredericton area, provides information which
be useful in land use planning, such as
ention of unsuitable land development in
plain areas, protection of homebuyers,
ning of emergency operations in advance of an
nding flood, and preservation of open space
ublic use. An information booklet, provided
the map, discusses the problem of flooding in
Fredericton area, flood mangitudes and
encies, and flood profiles. Use of the flood
d map is also considered. (Environment
da)
04157

OD HAZARD MAP, FREDERICTON AREA,
BRUNSWICK, SOUTHEAST SHEET.
rtment of the Environment, Ottawa
rio); and New Brunswick Dept. of Fisheries
nvironment.
17 p, 5 fig, 1 tab, 1 map. English and French.

iptors: *Precipation(Atmoshperic),
vmelt, *Flood peak, Flood frequency, Flood
es, Damages, Ice jams, Flood discharge,
da, *Maps, Mapping.
fiers: *Flood hazard map, Saint John River,
ricton, *New Brunswick, Flooding
ms, Nashwaaksis Stream, Baker Brook,
sing Falls, Mactaquac Dam.

nap, one of two flood hazard maps for the
icton area, provides information which may
ful in land use planning, such as prevention
suitable land development in flood plain
protection of homebuyers, planning of
ency operations in advance of an impending
and preservation of open space for public
n information booklet, provided with the
discusses the problem of flooding in the
icton area, flood magnitudes and frequen-
nd flood profiles. Use of the flood hazard
also considered. (Environment Canada)
4158

ENCE INDEX - CANADA 1972 -
OMETRIC MAP SUPPLEMENT.
ment of the Environment, Ottawa
o). Water Resources Branch; and Depart-
f the Environment, Ottawa (Ontario). In-
aters Directorate.
Survey of Canada, 1973, 13 maps.

tors: *Hydrometry, *Maps, *Gaging sta-
Canada, Water levels, Discharge(Water).
ers: *Hydrometric data, Hydrometric sta-

This is the first edition of the Hydrometric Map Supplement to the Surface Water Data Reference Index. Hydrometric Map Supplements will be produced probably every three years. The maps are intended to serve as a guide to the user to identify the locations of gauging stations at which hydrometric data are available. Different symbols are used to indicate the type of data collected, i.e., whether it is water level data or discharge data, and whether the station is active or discontinued. Information on the station name, drainage area, gauge location, discharge records, type of gauge, operation, magnetic tape, and additional notes are given in the main body of the Reference Index. Maps are prepared for the following provinces or regions: Atlantic Provinces, British Columbia, Ontario, Prairie Provinces, Quebec, Yukon and Northwest Territories. Two sets of maps are enclosed for each of the provinces or regions except Quebec. One set of maps shows all the active gauging stations contained in the 1972 Surface Water Data Reference Index, the other set shows all the discontinued stations. Both active and discontinued stations operated by the Federal Government in the Province of Quebec are shown on the one Quebec map. (Environment Canada)
W76-04160

INDUSTRIAL WATER RESOURCES OF CANADA; HUDSON BAY, LABRADOR AND ARCTIC DRAINAGE BASINS, 1959-1965,
Department of the Environment, Ottawa (Ontario). Water Quality Branch; and Department of the Environment, Ottawa (Ontario). Inland Water Directorate.
For primary bibliographic entry see Field 3E.
W76-04163

SURFACE WATER DATA, ALBERTA 1974.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.

Descriptors: *Hydrometry, *Surveys, *Surface waters, *Water levels, Gaging stations, *Data collections, Instrumentation, Drainage area, Stage-discharge relations, Discharge(Water), *Canada, *Hydrologic data.
Identifiers: *Alberta, Descriptive information, Hydrometric survey.

Tables are presented containing the 1974 results of a hydrometric survey conducted in Alberta by the Water Survey of Canada, under agreement with the Province of Alberta. Surface water data include tables of daily water levels or discharge, summaries of monthly and annual data, and descriptive information, for each gauging station. (Environment Canada)
W76-04167

SURFACE WATER DATA, ALBERTA 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
Water Survey of Canada, 1974, 204 p, 397 tab.

Descriptors: *Hydrometry, *Surface waters, *Surveys, *Water levels, Streamflow, Drainage, Water supply, Monitoring, *Hydrologic data, *Canada, *Data collections.
Identifiers: Discharge(Rates), Flow regulation, Instantaneous discharge, *Alberta.

For the 1973 calendar year, results are presented of the Hydrometric Survey investigations made by the Water Survey of Canada in Alberta. For each of 397 stations, either daily discharge in cfs, or daily water levels in feet are given. In addition, there is a summary including mean discharge, total discharge, maximum and minimum daily discharge, and maximum instantaneous discharge. The type of gauge used, the location, the size of drainage area and the presence or lack of regulating structures are also noted. (Environment Canada)
W76-04168

SURFACE WATER DATA, ATLANTIC PROVINCES 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.

Descriptors: *Water levels, *Fluctuations, Discharge(Water), Streamflow, Hydrometry, Monitoring, Surveys, Stage-discharge relations, Lakes, Rivers, Streams, Reservoirs, Data collections, Control, Water supply, *Canada, *Hydrologic data.
Identifiers: Flow regulation.

For the 1973 calendar year, results are presented of the hydrometric survey investigations made in the Atlantic provinces by the Water Survey of Canada. For each of 163 station (Prince Edward Island - 11, Nova Scotia - 42, New Brunswick - 69, Newfoundland and Labrador - 41), either daily discharges in cfs, or daily water levels in feet are given. In addition, each station report includes a summary containing mean discharge, total discharge, maximum and minimum daily discharge and maximum instantaneous discharge. The type of gauge used, location of station, the size of the drainage area, and the presence or absence of regulating structures are also noted. (Environment Canada)
W76-04169

SURFACE WATER DATA, SASKATCHEWAN 1973.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
Water Survey of Canada, 1974. 161 p, 314 tab.

Descriptors: *Water levels, Discharge(Water), Lakes, River, Streams, *Hydrometry, Drainage, Monitoring, *Surveys, Fluctuations, Measurement, Water supply, Hydrologic data, *Canada, Data collections.
Identifiers: Instantaneous discharge, *Saskatchewan.

For the 1973 calendar year results are presented of the Hydrometric Survey investigations made in Saskatchewan by the Water Survey of Canada. For each of 314 stations, either daily discharge in cfs, or daily water levels in feet are given. In addition, each station report includes a summary containing mean discharge, total discharge, maximum and minimum daily discharge and maximum instantaneous discharge. The type of gauge used, location of station, the size of the drainage area, and the presence or absence of regulating structures are also noted. (Environment Canada)
W76-04170

WATER QUALITY DATA, BRITISH COLUMBIA 1961 - 71.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; Department of the Environment, Ottawa (Ontario). Water Quality Branch.
1974, (600 p).

Descriptors: *Surface waters, *Water quality, Phosphorus, Fluorides, Chlorides, Sulphates,

Chemical oxygen demand, Bicarbonates, Dissolved solids, Calcium, Magnesium, Potassium, Sodium, Sampling, Chemical analysis, Water analysis, Water pollution, *Data collections, *Canada.
Identifiers: Reactive silica, *British Columbia.

Water quality data, collected under the National Water Quality Monitoring Program, from 319 sampling stations in British Columbia are given. The first section presents detailed analytical results from the period 1961 to 1971; the second presents a summary of the data, minima, maxima, and median values. The indices of water quality measured include pH, color, turbidity, specific conductivity, total dissolved solids, hardness, alkalinity and concentrations of various elements and compounds. The dae, precise location and where available, time and daily mean discharge are also given. (Environment Canada)
W76-04171

PROGRAM FRONT, TWO - DIMENSIONAL SIMULATION OF A MOVING INTRUSION FRONT IN A THIN HORIZONTAL CONFINED AQUIFER,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vanderberg.
1975, 40 p, 7 fig, 4 ref, 2 tab, append.

Descriptors: *Computer programs, *Aquifers, *Saline water intrusion, Interfaces, Groundwater, Pumps, Porosity, Computers, Data collections, Methodology, Aqueous solutions.
Identifiers: Cones, Nodes, Grid element.

Documentation is presented for the application of computer program FRONT (Two Dimensional Simulation of a Moving Intrusion Front in a Thin Horizontal Confined Aquifer). FRONT uses the time-variant piezometric head, the transmissivity, the thickness and the porosity of the aquifer to calculate the seepage velocity at any point of the aquifer at any time. By following the motion of a number of points on the intrusion front, the growth of the zone of encroachment can be followed through time. The piezometric head and the transmissivity are defined at the nodes of a rectangular grid superimposed on the aquifer; the thickness and porosity are assumed constant over the aquifer. Furthermore, the piezometric head is assumed to be input to the program as a time series in the form in which it is output on mass storage by program SOPH. The preparation of the input card deck is described in detail and further clarified by an example. A listing of the FORTRAN program is given in the Appendix. (Environment Canada)
W76-04172

PROGRAM TEBES, TRANSMISSIVITY, LEAKAGE FACTOR AND STORATIVITY FROM A LEAST SQUARES FIT OF RESIDUAL DRAWDOWN,
Department of the Environment, Ottawa (Ontario). Water Resources Branch; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vanderberg.
1975, 27 p, 2 tab, 7 ref, append.

Descriptors: *Computer programs, *Transmissivity, *Leakage, Least squares method, Systems analysis, Aquifers, *Drawdown, Groundwater.
Identifiers: *Program TEBES, *Storativity, Newton iterative, Residual drawdown.

Necessary documentation is presented for the application of computer program TEBES (Transmissivity, Leakage Factor and Storativity from a Least Squares Fit of Residual Drawdown). TEBES employs the extended Newton iterative method to calculate the transmissivity, leakage factor and storativity, which when substituted in the equation for the residual drawdown in an infinite, homogeneous and isotropic, leaky aquifer, yield the best fit (in the least squares sense) to the measured residual drawdown. The preparation of the impact card deck is described in detail and further clarified by an example. A listing of the FORTRAN program is given in the Appendix. (Environment Canada)
W76-04181

AUTOMATED STREAMFLOW COMPUTATIONS.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch.

Descriptors: *Streamflow, *Data collections, *Data processing, Water levels, Water supply, Gaging, Backwater, Monitoring, Charts, Weirs, *Streamflow forecasting.
Identifiers: *Computer applications, Discharge rates, Recording, Documents, Graphs, Outputs.

This manual provides detailed instructionf for digitizing water level recorder charts on a pencil follower to obtain punched cards containing the x,y coordinates. With these cards and the card decks defining the stage - discharge relationship, gauge and shift corrections and updating corrections, the computer program, STREAM, is used to obtain daily mean gauge heights and discharges along with the appropriate symbols. Options available include: three- or twelve- month pages of daily data with monthly summaries; card output of daily discharges or daily water levels; linear charts; weir stations, with water levels printed to the nearest .001 of a foot; plotted output of digitized chart record or daily discharges or water levels. Introductory sections give information on definitions and machine configuration and timing. Explanations of how the program subdivides the record to compute daily discharges, how to prepare charts for digitizing, hardware setup and operation instructions for all stages as well as quality checking, are included. (Environmental Canada)
W76-04241

SURFACE WATER DATA ATLANTIC PROVINCES 1974.
Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.; and Department of the Environment, Ottawa (Ontario). Water Resources Branch.; and Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
Water Survey of Canada, 1975, 93 p.

Descriptors: *Data collections, Drainage area, Instrumentation, Streamflow, Rivers, Hydrometry, Surveys, *Canada.
Identifiers: *Surface water data, *Atlantic Provinces, Daily water level, Daily water discharge, Monthly data, Newfoundland, Labrador, Prince Edward Island, New Brunswick, Nova Scotia.

The results of the hydrometric survey investigations made in the Atlantic Provinces, during the year 1974, are presented in table form. Information given for each gauging station includes a table of daily water level or discharge, a summary of monthly and annual data, and descriptive information such as the type of gauge, location of gauging station, and drainage area. (Environment Canada)
W76-04248

SURFACE WATER DATA, YUKON AND THE NORTHWEST TERRITORIES 1974.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
Water Survey of Canada, 1975, 62 p.

Descriptors: *Data collections, Drainage area, I
strumentation, Streamflow, Rivers, Hydrometr
Surveys, Discharges, *Canada.
Identifiers: *Surface water data, *Yuko
8northwest Territories, Daily water level, Dai
water discharge, Monthly data.

The results of the hydrometric survey investig
tions made in the Yukon and the Northwest Ter
tories, during the year 1974, are presented in tab
form. Information given for each gauging stati
includes a table of daily water level or discharge
summary of monthly and annual data, and descr
tive information such as the type of gauge, lo
tion of gauging station, and drainage ar
(Environment Canada)
W76-04249

SURFACE WATER DATA, MANITOBA 1974.
Department of the Environment, Otta
(Ontario). Applied Hydrology Div.; and Dep
ment of the Environment, Ottawa (Ontar
Water Resources Branch; and Department of
Environment, Ottawa (Ontario). Inland Wa
Directorate.
Water Survey of Canada, 1975, 157 p.

Descriptors: *Data collections, *Water lev
Drainage area, Natural flow, Regulated fl
Bodies of water, Lakes, Discharge(Water), Ga
stations, *Canada.
Identifiers: *Hydrometric survey, *Surface w
data, *Manitoba.

Results are presented of the hydrometric su
investigations which were made in 1974
Manitoba by the Water Survey of Canada u
agreement with the Province of Manitoba. G
ing stations were set up and surface water data
lected. Data are presented in tables of daily w
level or discharge, and summaries, are include
monthly and annual data. Descriptive informa
for each station including type of gauge, loca
of gauge, and drainage area is also gi
(Environment Canada)
W76-04250

SEDIMENT DATA - CANADIAN RIVERS 19
Department of the Environment, Ot
(Ontario). Water Resources Branch; and De
ment of the Environment, Ottawa (Ontario).
plied Hydrology Div.; and Department of the
vironment, Ottawa (Ontario). Inland W
Directorate.
Water Survey of Canada, 1975. 282 p, 2 maps.

Descriptors: *Erosion, *Streamflow, *Sedim
*Data collections, Suspended solids, Water
perature, Suspended load, Surveys, Sedi
yield, *Canada, *Rivers.
Identifiers: *Sediment survey, Suspended
ment concentration, Suspended sed
discharge, Hydrometric survey, Sediment
pling, Particle size analysis.

The results of sediment survey investigatio
Canada during 1971 have been compiled
presented. Included are data, from sediment
plers, on streamflow, daily suspended sed
discharges, daily mean suspended sediment
centration, particle size distribution of bed
particle size distribution of bed material
water temperatures. (Environment Canada)
W76-04251

USES OF WATER RESOURCES DATA,
Department of the Environment, C
(Ontario). Water Resources Branch; and D
ment of the Environment, Ottawa (Ontari
land Waters Directorate.
P. I. Campbell.
1975. 6 p, 6 photos.

Descriptors: *Water resources, *Data colle
*Water management(Applied), Hydro

eamflow, Water levels, Discharge(Water), mperature, Velocity, Sediments, Glaciers, drologic data.
ntifiers: Ice thickness.

drometric data, a type of water resources data, e a wide variety of uses and users. Basic drometric data are essential for the wise nagement of Canadian water resources and are essary to regulate resources during times of ex- ne flows, to develop water for the most benefi- uses, to ensure that each user receives his itable share and, as well, to achieve, these pur- es in the most economical manner. The wide iety of uses of hydrometric data, is illustrated. vironment Canada)
6-04255

RFACE WATER DATA, ONTARIO 1974.
artment of the Environment, Ottawa tario). Inland Waters Directorate.
er Survey of Canada, 1975, 233 p.

criptors: *Surface waters, *Data collections, drometry, Water levels, Discharge(Water), In- mentation, Gages, Surveys, *Canada, rologic data.
tifiers: *Ontario.

results of the hydrometric survey investiga- s which were made in Ontario during the year by the Water Survey of Canada, under agree- t with the province of Ontario, are presented. es containing information on daily water ls of discharge, summaries of monthly and an- data, and descriptive information are ented for each gauging station. Descriptive in- ation includes type of gauge, location and age area. (Environment Canada)
-04256

ER QUALITY DATA, YUKON TERRITO- 961 - 1973.
rtment of the Environment, Ottawa ario). Water Quality Branch; and Department ne Environment, Ottawa (Pntario). Inland rs Directorate.
155 p.

riptors: *Water Quality, *Data collections, r temperature, Flow, Discharge(Water), Gag- ations, *Canada, *Hydrologic data.
ifiers: *YukonTerritory(Canada), Discharge, ometric data, NAQUADAT.

nted in table form are water quality data for ukon Territory during the years 1961 to 1973. data have been determined in Water Quality h laboratories as part of the National Water ty Monitoring Program. This summary of Quality Data contains information on water rature, water flow and discharge for various ic locations within the Yukon. A guide to the tables is included. (Environment Canada)
04257

HER CLIMATOLOGICAL STUDIES OF N ISLAND, NORTHWEST TERRITO-

tment of the Environment, Ottawa io). Water Resources Branch; and Depart- of the Environment, Ottawa (Ontario). In- aters Directorate.
mary bibliographic entry see Field 2B.
4259

D DAMAGE IN FREDERICTION.
ment of the Environment, Ottawa io). Inland Waters Directorate.
1 fig.

ptors: *Floods, *Flood forecasting, *Flood e, Flood plains, Watershed management, s, Flood protection, Dams, *Maps, a.

Identifiers: *Emergency measures, Flood proofing, *Frederiction(New Brunswick).

This map shows regions flooded in the Frederiction area during the year 1973. Accompanying the map is a brief information sheet which discusses floods. the flood plain, flood plain management, flood damages, emergency measures, and measures to reduce flood damages, including engineering works, preventive measures, and flood plain regulations. (Environment Canada)
W76-04260

PREDICTING PROFILES OF SNOWDRIFTS IN TOPOGRAPHIC CATCHMENTS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W76-04288

AUSTRALIA DAMS AND STORAGES.
Department of Minerals and Energy, Canberra (Australia). Div. of National Mapping.
Map NMP 74/093, 1975. 1 p, $1.20.

Descriptors: *Maps, *Reservoirs, *Dams, *Australia, Rivers, Streams, Watersheds(Basins), Basins, Drainage, Water storage, Data collections.

On a 1:5,000,000 scale map, the 12 drainage divisions of Australia were shown by different colors. Drainage basin boundaries are delineated. The locations of 340 dams were plotted, along with a key which refers to tables located around the margins of the map. For each division having dams and storage reservoirs, a table listed the name of each dam with its key number, and tabulated other information about the dam and reservoir. The capacity of each reservoir was listed along with the height of the dam crest above the lowest point in the foundation. One or more purposes were given for each storage, chosen from the following list: (1) irrigation, (2) hydroelectric generation, (3) water supply, (4) flood control, (5) navigation, (6) recreation and (7) waste disposal. The streams and rivers were depicted on the map in lines which show the general magnitude of the discharge and the seasonal characteristics of the stream. The larger lakes and reservoirs were shown by their general shapes on the map. Two shades of blue distinguish reservoirs with surface areas greater than and less than 50 sq km. (Sims-ISWS)
W76-04307

ANALYSIS AND SYNTHESIS OF FLOOD CONTROL MEASURES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W76-04308

APPLICATIONS OF MICROWAVES TO REMOTE SENSING OF TERRAIN,
Radiometric Technology, Inc., Wakefield, Mass.
For primary bibliographic entry see Field 7B.
W76-04314

CASCADE PASSES AVALANCHE ATLAS, PART I: CHINOOK, CAYUSE, WHITE AND SNOQUALMIE PASSES,
Washington Univ., Seattle. Dept. of Civil Engineering; and Washington Div., Seattle. Geophysics Programs.
E. R. LaChapelle, C. B. Brown, and R. J. Evans.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-237 435, $5.25 in paper copy, $2.25 in microfiche. Report, August 1974, 103 p.

Descriptors: *Maps, *Avalanches, *Highways, *Snow, *Washington, Surveys, Erosion, Hazards, Safety, Landslides, Snowpacks, Snow management.

This compilation of avalanche paths affecting Washington State highways extends in the same format the information published in 1971 as the North Cascades Highway Avalanche Atlas, Part II, in preparation, will cover Stevens Pass and Tumwater Canyon. The North Cascades Highway Atlas was prepared on the basis of extensive aerial and ground reconnaissance in a hitherto inaccessible wilderness area where no previous record of avalanche occurrence was available. Compilation for the Cascade Passes has proceeded on the same basis, with the added advantage that all of the areas in question have long been traversed by highways for which considerable historical records exist. In the case of the North Cascades Highway, identification of avalanche paths was based on objective appraisal of terrain and vegetation patterns, leading to an accurate and highly consistent compilation. In the present Cascade Passes Atlas, there are many instances where objective evidence and historical accounts fail to agree. These conflicts have been resolved in the final editing of this Atlas according to the best available evidence, but in some case necessarily in an arbitrary fashion. (Sims-ISWS)
W76-04318

CORRELATION ANALYSIS OF WIND AND ICE DRIFT DATA TAKEN AT LINCOLN BAY 1972,
Defence Research Establishment, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W76-04322

PROBLEMS OF CALCULATING THE THERMAL RADIATION OF MULTILAYERED STRUCTURES OF THE ICE AND SNOW TYPES BY MEANS OF ORIENTED GRAPHS USING AN ELECTRONIC COMPUTER,
For primary bibliographic entry see Field 2C.
W76-04324

THE USE AND LEGAL SIGNIFICANCE OF THE MEAN HIGH WATER LINE IN COASTAL BOUNDARY MAPPING,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-04355

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1970: PARTS 4 AND 5. ST. LAWRENCE RIVER BASIN, AND HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS.
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Wash., D.C. 20402, price, $4.15. Water-Supply Paper 2154, 1975. 482 p, 1 fig, 41 ref.

Descriptors: *Pollutant identification, *Water quality, Surface waters, *Sediment transport, *Water temperature, *Basic data collections, Water analysis, River basins, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Organic compounds, Water chemistry, Biochemistry, Streamflow, Flow measurement.
Identifiers: *St Lawrence River basin, *Hudson Bay, *Upper Mississippi River basin.

During the water year ending September 30, 1970, the Geological Survey maintained 170 stations on 107 streams in the St. Lawrence River basin, and Hudson Bay and Upper Mississippi River basins for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 116 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 72 and daily at 25 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are re-

ported for 31 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 19 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W76-04392

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1969: PART 7. LOWER MISSISSIPPI RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Wash., D.C. 20402, Price $3.85. Water-Supply Paper 2146, 1974. 540 p, 1 fig, 40 ref.

Descriptors: *Pollutant identification, *Water quality, *Surface waters, *Sediment transport, *Water temperature, *Mississippi River basin, Basic data collections, Arkansas, Colorado, Kansas, Kentucky, Louisiana, Mississippi, Missouri, New Mexico, Oklahoma, Texas, Physical properties, Particle size, Chemical analysis, Inorganic compounds, Biological properties, Streamflow, Sampling, Sites.
Identifiers: *Lower Mississippi River basin.

During the water year ending September 30, 1969, the Geological Survey maintained 259 stations on 156 streams in the Lower Mississippi River basin for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 235 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 28 and daily at 79 stations. Daily water temperatures were measure at most of the stations at the time samples were collected for chemical quality or sediment content. So far as practicable, the water temperatures were taken at about the same time each day. Quantities of suspended sediment are reported for 19 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 19 stations. The stream discharge reported for a composite sample is usually the average of daily mean discharges for the composite period. The discharges reported in the tables of single analyses are either daily mean discharges or discharges obtained at the time samples were collected and computed from a stage-discharge relation or from a discharge measurement. (Woodard-USGS)
W76-04393

WATER-LEVEL RECORDS FOR COLORADO, 1971-75,
Geological Survey, Denver, Colo.
T. J. Major, L. Kerbs, and R. D. Penley.
Colorado Water Conservation Board, Denver, Colorado Water Resources Basic-Data Release No 37, 1975. 356 p, 65 fig, 2 tab, 61 ref.

Descriptors: *Water levels, *Groundwater, *Water wells, *Water level fluctuations, *Colorado, Water level recorders, *Basic data collections, Sites, Well data, Aquifers.

Water-level measurements made in Colorado prior to the irrigation season in 1975 are presented. Measurements from 1971-74 were made at the same time of year and are included to serve as references illustrating declining or rising water levels. The number of wells that were measured was dependent, partly, on the size of the aquifer and on the intensity of groundwater use. West of the Continental Divide, where groundwater withdrawal is low, the water-level fluctuations reflect mostly changes in natural conditions. East of the Continental Divide, because of substantial utilization of groundwater by man, the major fluctuations are caused by artificial withdrawal. Hydrographs and water-level change maps are included to illustrate responses to natural and man-made stresses on the aquifer. (Woodard-USGS)
W76-04394

WATER-QUALITY DATA FROM OIL AND GAS WELLS IN PART OF THE PERMIAN BASIN, SOUTHEASTERN NEW MEXICO AND WESTERN TEXAS,
Geological Survey, Albuquerque, N. Mex.
W. L. Hiss.
Open-file report 75-579, November 1975. 283 p, 14 fig, 7 tab, 18 ref.

Descriptors: *Water quality, *Groundwater, *Oil wells, *New Mexico, *Texas, Well data, Data collection, Geology, Geologic formations, Data processing, Chemical analysis, Saline water, Correlation analysis, Dissolved solids, Chlorides, Density, Computer programs.
Identifiers: Northeastern New Mexico, Western Texas.

Approximately 8,000 chemical analyses of water produced from formations of several geologic ages in northeastern New Mexico and western Texas are tabulated by both geographic location and geologic formation. Empirical and mathematical relationships between (1) the dissolved solids and the measured and computed resistivity of water, the chloride-ion concentration and the density, and (2) the concentration of chloride-ion and the density and resistivity of water, were established. Resistivities of water computed following a method developed by Moore, Szasz, and Whitney (1966) using the concentration of the six most common constituents dissolved in natural water correlate favorably with the measured resistivities of natural water. The water analyses were obtained chiefly from oil companies and oil-service companies operating in the western part of the Permian basin. (Woodard-USGS)
W76-04395

INTERPRETATION OF GEOLOGIC AND HYDROLOGIC DATA FROM THE RAY-1 WELL, CITY OF GALLUP, MCKINLEY COUNTY, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W76-04396

GRAPHIC AND TABULAR SUMMARIES OF WATER AND SUSPENDED-SEDIMENT DISCHARGE DURING EIGHT PERIODS OF SYNOPTIC STORM SAMPLING IN THE LOWER DRAINAGE BASIN OF REDWOOD CREEK, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. J. Janda, K. M. Nolan, and D. R. Harden.
Open-file report, December 1975. 23 p, 8 fig, 2 plate, 10 tab, 2 ref.

Descriptors: *Streamflow, *Discharge(Water), *Sediment transport, *Storms, *California, River basins, Basic data collections, Sampling, Land use, Hydrologic data, Peak discharge, Rainfall-runoff relationships, Synoptic analysis.
Identifiers: Humboldt County(Calif), *Redwood Creek(Calif).

Graphs and tables summarize basic data in the lower drainage basin of Redwood Creek, Humboldt County, Calif. Data were collected throughout eight storms of low to moderate intensity between November 1973 and February 1975. Collection sites were located on Redwood Creek and seven of its tributaries. Also included are photographs and tables that indicate the location and physical properties of the drainage basins selected for synoptic studies. (Woodard-USGS)
W76-04398

A SURVEY OF THE WATER RESOURCES OF ST. CROIX, VIRGIN ISLANDS,
Geologic Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 4A.
W76-04399

SUMMARY OF HYDROLOGIC CONDITION IN COLLIER COUNTY, FLORIDA, 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-04403

POTENTIOMETRIC SURFACE AND AREAS O ARTESIAN FLOW OF THE FLORIDIA AQUIFER IN FLORIDA, MAY 1974,
Geological Survey, Tallahassee, Fla.
H. G. Healy.
Florida Bureau of Geology, Tallahassee, Map S ries No 73, 1975. 1 sheet, 2 fig, 17 ref.

Descriptors: *Potentiometric level, *Artesi aquifers, *Water supply, *Groundwa resources, *Aquifer characteristics, *Flori Maps, Water supply, Water yield, Water utili tion.
Identifiers: *Floridan aquifer.

The configuration of the potentiometric surf and the areas of artesian flow of the Flori aquifer in Florida as of May 1974 are shown maps. The potentiometric surface is the level which water will rise in tightly cased wells that the aquifer. The level of the surface is referen to sea level. The position of the potentiome surface for May 1974 is based on water levels m sured in 670 wells in Florida. The water le were measured and the maps prepared as an tegral part of the continuing cooperative prog of monitoring the groundwater resources of state. The Floridan aquifer is part of an arte aquifer system that extends over 82,000 sq m Florida, southern Alabama, southeastern Geor and part of South Carolina, and is a princ source of groundwater supplies in these areas Florida, the aquifer consists chiefly of limest formations ranging from middle Eocene Miocene in age. The aquifer is the major sourc fresh groundwater supplies in the State of Flo In 1970, the aquifer supplied about 280 mgd municipal use, 710 mgd for agricultural use, 360 mgd for industrial use. This total deman 1,350 mgd represents 47 percent of the total f fresh groundwater use in the State. (Wood USGS)
W76-04405

FLOW-DURATION AND LOW-FL FREQUENCY DETERMINATIONS SELECTED ARKANSAS STREAMS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4A.
W76-04406

COCKEYSVILLE QUADRANGLE: GEOLO HYDROLOGY AND MINERAL RESOURCE
Geological Survey, Parkville, Md.
E. G. Otton, E. T. Cleaves, W. P. Crowley, K. Kuff, and J. Reinhardt.
Maryland Geological Survey, Baltimore, Qua gle Atlas No 3, 1975. 8 maps. 10 ref.

Descriptors: *Hydrogeology, *Geo *Mineralology, *Maps, *Maryland, Water Springs, Water table, Groundwater reso Available water, Underground waste dis Sewage disposal, Percolation, Environment fects.
Identifiers: Cockeysville quadrangle(Md), M resources.

is folio describes the geology, hydrology, and neral resources of a 7 1/2 minute topographic adrangle in north-central Maryland. It is inded for county, State and Federal officials as ll as engineers, planners, developers, indusists, and the general public involved in environntal matters such as water supply, waste posal, and land-use planning. The Cockeysville adrangel covers an area of 57.3 square miles and entirely within Baltimore County. No incorated towns are in the quadrange, but the comnities of Cockeysville, Ruxton, Pikesville, and therville lie wholly or partly within it. The adrangle lies on the suburban fringe of Balore City, and its southern limit is 0.2 mile north the city line. The maps and the associated text w: the location of several hundred wells and a springs and test borings; the approximate th to the water table; availability of groundter supplies; and geohydrologic conditions perning to underground sewage effluent disposal. podard-USGS)
6-04407

OUND-WATER RESOURCES OF WAUSHA COUNTY, WISCONSIN,
ological Survey, Portland, Oreg.
primary bibliographic entry see Field 2F.
6-04408

ENGINEERING WORKS

. Structures

NAMIC PROPERTIES OF SAN BERNARIO INTAKE TOWER,
ifornia Univ., Berkeley. Earthquake Engineer-Research Center.
Rea, C-Y. Liaw, and A. K. Chopra.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as AD-A008 , $4.50 in paper copy, $2.25 in microfiche. Re- No EERC 75-7, February 1975. 62 p, 32 fig, 6 9 ref. DACW73-71-C-0051.

criptors: *Intakes structures, *Intakes, rthquake engineering, *Vibrations, lifornia, Earthquakes, Structures, Towers, uctural stability, Engineering, Resonance, On- investigations, On-site tests, Hydrodynamics, namics, Non-destructive tests, Testing cedures.
ntifiers: *Intake towers, *San Bernar-o(Calif).

ee series of forced vibration tests were con-ted on the intake tower located in Silverwood e near San Bernardino, California. In the first series the water level in the reservoir was just ve the base of the tower so the effects of water ls behavior were negligible. In the second and l series the water submerged nearly two-thirds ne tower. In the second test series the inside of tower was empty, whereas in the third series ower was filled with water to the same level as water in the reservoir. Of the seven modes ted during the forced vibration tests, only one e would be excited with significant amplitudes ng strong earthquake ground motion. The ral frequency of this mode was 2.1, 2.0, and ps in the first, second, and third test series ectively, and its damping factor lay in the e 1.0 - 1.2% of critical damping for each series. changes in resonant frequencies between test s, together with the measured mode shapes estimated mass distributions of the towerge system were used to calculate the added effects of water outside and inside the tower. added mass effects could not be determined sufficient precision by this method to check ccuracy of analytical methods of calculating d masses. However, the analytical method found to predict accurately the dynamic water sure distributions that were measured during ests. (Sims-ISWS)
W76-04107

SPILLWAY FOR DORENA DAM, ROW RIVER, OREGON; HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 310, $5.00 in paper copy, $2.25 in microfiche. Report No 27-1, May 1953. 94 p, 46 fig, 11 tab.

Descriptors: *Model studies, *Hydraulic models, *Spillways, *Oregon, Dams, Settling basins, Baffles, Abutments, Rivers, Structures, Hydraulic structures, Hydraulics, Hydraulic properties, Civil engineering.
Identifiers: *Dorena Dam(Ore), *Row River(Ore).

Dorena Dam and Reservoir has been constructed on the Row River approximately 46 highway miles south-southeast from Eugene, Oregon, and about 165 highway miles south of Portland, Oregon. Model investigations of the gravity spillway plan for Dorena Dam were conducted. The general purpose of the investigations was to check the adequacy of the original gravity-type-spillway design and, where possible, to make revisions in design which would improve hydraulic efficiency. (Sims-ISWS)
W76-04110

CONCRETE ABRASION STUDY, BONNEVILLE SPILLWAY DAM, BONNEVILLE, OREGON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
For primary bibliographic entry see Field 8F.
W76-04111

SIDE-CHANNEL SPILLWAY NORTH HARLAND DAM, OTTAUQUECHEE RIVER, VERMONT; HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04114

MODEL STUDY OF THE SPILLWAY AND TUNNEL FOR DORENA DAM, ROW RIVER, OREGON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04115

REVISED STILLING BASIN, BONNEVILLE DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04116

MODEL STUDY OF THE 23-FT. OUTLET TUNNEL FOR MUD MOUNTAIN DAM, ENUMCLAW, WASHINGTON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04120

SIDE-CHANNEL SPILLWAY AND OUTLET WORKS FOR LOOKOUT POINT DAM, MIDDLE FORK WILLAMETTE RIVER, OREGON, HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04124

SPILLWAY AND STILLING BASIN FOR THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04125

OUTLET WORKS AND STILLING BASIN FOR COUGAR RESERVOIR, SOUTH FORK MCKENZIE RIVER, OREGON; HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04126

THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04127

FIELD CALIBRATION OF FLOW MEASURING STRUCTURES,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 8G.
W76-04302

CASE STUDY OF A HYDROELECTRIC DAM: THE DICKEY-LINCOLN SCHOOL PROJECT,
Massachusetts Inst. of Tech., Cambridge. Civil Engineering Program.
For primary bibliographic entry see Field 6G.
W76-04347

STORM KING MOUNTAIN (PUMP STORAGE PLANT).
For primary bibliographic entry see Field 5G.
W76-04440

SUSQUEHANNA RIVER BASIN COMMISSION - REVIEW OF PROJECTS.
Susquehanna River Basin Commission, Mechanicsburg, Pa.
For primary bibliographic entry see Field 6E.
W76-04451

8B. Hydraulics

YOUR DOWNHOLE MOTOR: HEY, WHERE'D IT GO.
For primary bibliographic entry see Field 8C.
W76-04050

NAVIGATION CHENNEL IMPROVEMENT AT BONNEVILLE DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 330, $5.50 in paper copy, $2.25 in microfiche. Technical Report No 100-1, May 1966. 125 p, 102 fig, 7 tab.

Descriptors: *Model studies, *Navigation, *Bonneville Dam, *Columbia River, Velocity, Channel flow, Flow, Dams, Spillways, Navigable waters, Current(Water), Channel Improvement, Channels, Stream improvement, Rivers, Hydraulics, Hydraulic models, Dredging, Civil engineering.

An undistorted 1:130-scale hydraulic model was used to develop a plan for reducing hazardous conditions that affected upstream-bound river traffic in a 4-mile reach of the Columbia River just below Bonneville Dam. Before 1959, when the study was made, river traffic past Bonneville Dame consisted principally of tug-propelled log rafts and barges, but it was expected that upstream industrial development and completion of the authorized 27-ft-deep navigation channel from Vancouver, Washington, to The Dallas, Oregon, would encourage use of the navigation lock by deep-draft vessels. A radio-controlled model of a type C-4 cargo ship was used to check the effectiveness of various improvement plans that were studied. It was concluded that the most satisfactory solution to navigation problems caused by high velocities and severe cross currents would include 1,327,000 cu yd of excavation. Locations for placing excavated material were determined during the study. In addition to navigation benefits, the recommended plan would increase powerhouse head (by lowering tailwater depth) from 0.6 to 1.3 ft for river discharges between 100,000 and 800,000 cfs, respectively. (Sims-ISWS)
W76-04109

SPILLWAY FOR DORENA DAM, ROW RIVER, OREGON; HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8A.
W76-04110

SIDE-CHANNEL SPILLWAY NORTH HARLAND DAM, OTTAUQUECHEE RIVER, VERMONT; HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 322, $4.50 in paper copy, $2.25 in microfiche. Technical Report No 86-1, December 1959. 52 p, 34 fig, 4 tab, append.

Descriptors: *Model studies, *Hydraulic models, *Spillways, Dams, Structures, Hydraulic structures, Outlet works, Hydraulics, Channel flow, Channels, Civil engineering.
Identifiers: *Hartland Dam(Vt), *Side-channel spillways, *Ottauquechee River(Vt).

The hydraulic performance of the side-channel spillway for North Hartland Dam was studied by means of a 1:50-scale comprehensive model that reproduced portions of the forebay area and earth dam, spillway approach, uncontrolled spillway, and chut-type exit channel. An estimated peak discharge of 30,400 cfs occurred at the project site in 1927 and is the maximum historical flood. The project design flood has a peak outflow discharge of 171,000 cfs. The outlet works will be capable of passing 10,100 cfs at maximum pool with one gate inoperative, thereby reducing the required instantaneous spillway discharge to 160,900 cfs. Tests of the original design spillway, which featured a straight, 450-ft-long crest, indicated that performance was satisfactory after realignment of forebay excavation upstream from the left abutament. A study of an L-shaped spillway was made after a cost analysis revealed that considerable savings would result by its use if the left abutament of the earth dam was realigned and the spillway axis were moved approximately 200 ft downstream. The tests showed that an L-shaped spillway with an over-all length of 464 ft, vertical right abutment, realigned excavation along the left bank, and minimum chute lining satisfied all hydraulic requirements. (Sims-ISWS)
W76-04114

MODEL STUDY OF THE SPILLWAY AND TUNNEL FOR DORENA DAM, ROW RIVER, OREGON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 404, $7.75 in paper copy, $2.25 in microfiche. Report No 11-1, November 16, 1942. 203 p, 183 fig, 18 tab, append.

Descriptors: *Model studies, *Hydraulic models, *Dams, *Tunnels, Structures, Hydraulic structures, Tunnel hydraulics, Spillways, Outlet works, Dam design, Hydraulics, Civil engineering.
Identifiers: *Dorena Dam(Ore).

At the extreme right end of Dorena Dam, which is a part of the Willamette Basin Project of Oregon, an overflow spillway, stilling basin, and outlet works will furnish flood control and increased low-water flow for the Coast Fork and Willamette Rivers. The spillway with a crest length of 188 ft and a height of 121 ft was designed to pass flood flows up to a maximum of 95,400 cfs. The model study of the spillway and tunnel, for Dorena Dam was conducted at the Bonneville Hydraulic Laboratory, Bonneville, Oregon. The general purpose of the study was to determine by means of a 1-to-50 scale model the hydraulic characteristics of the originally-designed spillway, stilling basin, and outlet works of Dorena Dam and to develop satisfactory alternate designs for any of the features found to be hydraulically inadequate. The model study was responsible for effecting changes in the design of the first approach wall, left abutment, chut sidewalls, bucket, baffle system, tunnel and lip air vents, and the tunnel outlet. The hydraulic characteristics of the outlet tower and of various designs of the approach apron floor elevation, crest profile, chute, stilling basin floor elevation, and end sill were determined so as to establish their worth. (Sims-ISWS)
W76-04115

REVISED STILLING BASIN, BONNEVILLE DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 321, $5.00 in paper copy, $2.25 in microfiche. Technical Report No 65-1, July 1958. 89 p, 45 fig, 22 tab, append.

Descriptors: *Model studies, *Hydraulic models, *Spillways, *Bonneville Dam, *Columbia River, Dams, Baffles, Settling basins, Concretes, Structures, Hydraulic structures, Erosion, Scour, Cavitation, Fluid mechanics, Hydraulics, Civil engineering.

Bonneville Dam spans the Columbia River between the states of Oregon and Washington approximately 145 miles from the Pacific Ocean. When it was designed and constructed, the spillway for Bonneville Dam was unprecedented insofar as the magnitude of flow was concerned; the adopted plan was based on results of more than 170 experiments in a hydraulic model. Full operation of the spillway began in April 1938. Underwater inspections made during 1939 revealed considerable erosion of the cavitation type on the sides and at the downstream corners of the baffle piers. Damage to the baffle deck and erosion in the exit channel increased so rapidly during the period 1948 to 1952 that major repairs were considered imperative. Uncertainties regarding the cause of the damage, and the need for determining the best method for revising the stilling basin to minimize future maintenance, led to the conclusion that model studies and an analysis of past operational procedures would provide the best solution to the problems involved. Studies of more than 20 alternative stilling basin plans indicated that the existing design could be improved by streamlining th upstream row of baffle piers and converting th downstream row to a solid sill having the sam dimensions as the baffles of original design. (Sim ISWS)
W76-04116

SPILLWAY PRESSURE HEAD INVESTIGA TION, BONNEVILLE SPILLWAY DAM, BO NEVILLE, OREG.
Army Engineer Div. North Pacific, Bonnevill Oreg. Div. Hydraulic Lab.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as AD-A0 402, $4.00 in paper copy, $2.25 in microfiche. R port No 3-1, July 25, 1941. 31 p, 18 fig, 3 tab.

Descriptors: *Model studies, *On-site investig tions, *Pressure head, *Bonneville Da *Columbia River, Dams, Spillways, Hydrau models, Instrumentation, Piezometers, Measu ment, Pressure, Hhyraulics, Gates, Spillw gates, Structures, Hydraulic structures, Civil gineering.

The purpose of the Spillway Pressure Head vestigation was to observe the pressures on crest of the spillway dam at Bonneville, Oreg and to make comparison of these prototype d with similar model data. It was shown that with gate in the downstream position, negative pr sures (less than one atmosphere) scarcely exist the spillway crest. With the gate in the upstre position, however, increasing negative pressu on the crest are shown to obtain for at least all g openings up to 4.00 ft. The results of the prototy tests with the gate in the downstream slot co pared fairly well with both those of the 1:36-sc model and the 1:5-scale model. With the gate in upstream slot, however, discrepancies betw the pressure observations of the prototype and 1:5-scale model were quite evident in cer areas; a satisfactory comparison existed in ot areas. (Sims-ISWS)
W76-04118

HIGH VELOCITY CHANNEL, SOUTH FO COEUR D'ALENE RIVER AT WALLA IDAHO.
Army Engineer Div. North Pacific, Bonnev Oreg. Div. Hydraulic Lab.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as AD-A 340, $5.50 in paper copy, $2.25 in microfiche. port No 139/1, November 1969. 110 p, 83 fig tab.

Descriptors: *Model studies, *Hydraulic mod *Channel flow, *Idaho, Channeling, Chan Rivers, Open channels, Concrete-lined ca Flow, Streamflow, High flow, Velocity, Hyd lics, Civil engineering.
Identifiers: *Coeur d'Alene River(Ida *Wallace(Idaho), High-velocity channels.

This report covers the hydraulic model study paved, high-velocity channel for the South Fo the Coeur d'Alene River through Wallace, Id The proposed design of the paved high-velo channel was satisfactory and adequate exce the upstream ends of the existing channel w where the south wall and a section of the n bank must be increased in height. Because th isting structures are adequate, the prop modifications to the channel under the Bank S arch bridge and the north wall upstream from bridge are not necessary. If the end of the s wall were raised, the upstream end of the p channel, which was designed for a discharg 5325 cfs, would have a capacity of 5900 cfs size and extent of a riprap proposed for prote at the downstream end of the channel ca reduced. The proposed Corps of Engineers fluence for Placer Creek was satisfactory fo design conditions. The existing confluence culvert would satisfactorily pass 1960 cfs, th

ing capacity of the creek channel upstream from
e culvert, if the proposed north wall of the river
annel opposite the creek were higher. By raising
greater length of the north channel wall, the ex-
ing confluence and culvert would be adequate to
ss the design discharges of the proposed Corps
Engineers flood control project for Placer
eek. (Sims-ISWS)
76-04119

**ODEL STUDY OF THE 23-FT. OUTLET TUN-
L FOR MUD MOUNTAIN DAM, ENUM-
AW, WASHINGTON.**
my Engineer Div. North Pacific, Bonneville,
g. Div. Hydraulic Lab.
ailable from the National Technical Informa-
n Service, Springfield, Va 22161 as AD-A000
, $5.50 in paper copy, $2.25 in microfiche. Re-
t No 6-1, July 15, 1942. 101 p, 103 fig, 4 tab.

scriptors: *Model studies, *Tunnel hydraulics,
ydraulic similitude, Tunnels, Diversion tunnels,
ms, Tunnel design, Structures, Hydraulic struc-
es, Outlet works, Hydraulics, Civil engineering,
draulic models.
ntifiers: *Mud Mountain Dam(Wash).

d Mountain Dam, authorized under the Flood
ntrol Act of June 22, 1936, is located on the
ite River about 25 miles to the east of Tacoma,
shington. The primary purpose of Mud Moun-
Dam is to protect the Puyallup Valley and the
oma industrial district against flood waters that
inate on the north slopes of Mt. Rainer. Deten-
of peak river discharges in the reservoir and
release of these waters through regulating
es constitutes the general operation plan of the
ject. The model study of the 23-ft outlet tunnel
Mud Mountain Dam was conducted at the Bon-
ille Hydraulic Laboratory, Bonneville,
gon. The general purpose of the study was to
stigate the hydraulic characteristics of the tun-
and its appurtenances as designed, by means of
s performed on a 1-to-25 scale model. The
lts of these tests were described in detail, and
mmendations concerning the design and
ration of the tunnel were made. (Sims-ISWS)
5-04120

**IGATION LOCK FOR MCNARY DAM,
LUMBIA RIVER, OREGON AND WASHING-
N: HYDRAULIC MODEL INVESTIGATION.**
y Engineer Div. North Pacific, Bonneville,
g. Div. Hydraulic Lab.
ilable from the National Technical Informa-
Service, Springfield, Va 22161 as AD-A 000
Price $6.75 in paper copy, $2.25 in microfiche.
ort No. 26-1, May 1955. 172 p, 79 fig, 14 tab,
nd.

criptors: *Model studies, *Hydraulic models,
cks, *Dams, *Columbia River, Structures,
raulic structures, Navigation, Valves,
raulics, Flow control, Engineering structures,
engineering.
tifiers: *McNary Dam(Wash Ore).

ary Dam is an important unit in the com-
ensive plan for the development of the
mbia River Basin. This combined power-and-
gation structure is now under construction ap-
imately 196 miles upstream from Portland,
on, and is near the town of Umatilla, Oregon.
el studies of the navigation lock for McNary
were conducted at the Bonneville Hydraulic
ratory, Bonneville, Oregon, for the Portland
Walla Walla District Offices. The general pur-
of the studies was to develop, by means of a
scale model of the lock and a 1:20-scale
l of a tainter valve, a satisfactory and
omical design for the lock hydraulic system.
ydraulic system that was adopted as a result
e model studies will fill the 86-ft-wide by 675-
g lock in 16.1 min and will empty it in 15.7
nder a head of 92 ft (normal pool Elev 340;
num tailwater Elev 248). (Sims-ISWS)
04121

MODEL STUDY OF THE BONNEVILLE NAVIGATION CHANNEL, BONNEVILLE, OREGON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Report No. 2-1, January 30, 1942. 137 p, 134 fig, 4 tab, append.

Descriptors: *Model studies, *Navigation, *Bonneville Dam, *Columbia River, Flow, Channel flow, Velocity, Currents(Water), Hydraulic models, Navigable waters, Dams, Spillways, Channels, Channel improvement, Rivers, Dredging, Hydraulics, Civil engineering.

The model study of the Bonneville Navigation Channel was conducted at the Bonneville Hydraulic Laboratory, Bpnneville, Oregon. The general purpose of the study was to determine the best improvement plan to eliminate hazardous currents at the entrance to the downstream lock approach canal and to provide an efficient tailrace channel with a minimum of head loss and shoaling at the channel exit. Bonneville Dam, located on the Columbia River at Bonneville, Oregon, consists of a spillway, powerhouse, and navigation lock. The powerhouse will ultimately have ten turbine-generator units with a designed capacity of 518,400 kw. The navigation lock (76 ft wide and 500 ft long) is designed to lift ocean-going vessels a maximum of 66 ft to the upper pool, where they may then travel upstream to The Dallas, Oregon. The results of the model study showed that two major excavations should comprise the recommended improvement plan. The present powerhouse tailrace channel should be excavated (1,550,000 cu yds). Garrison Point on the Washington shore opposite the entrance to the downstream lock approach canal should be cut back. (Sims-ISWS)
W76-04122

MODEL STUDY OF THE WILLAMETTE FALLS LOCKS, OREGON CITY, OREGON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD A 000 403, Price $7.50 in paper copy, $2.25 in microfiche.
Report No. 8-1, June 10, 1941. 180 p, 134 fig, 13 tab, append.

Descriptors: *Model studies, *Hydraulic models, *Locks, *Oregon, Waterfalls, Rivers, Navigation, Structures, Hydraulic structures, Hydraulics, Hydraulic properties, Siphons, Civil engineering.
Identifiers: *Willamette Falls Locks(Ore), *Willamette River.

The Willamette Falls Locks are situated on the west bank of the Willamette River opposite Oregon City, Oregon. These locks are five in number, and together with a canal, or lock basin, they form a waterway which passes through the congested industrial area around Willamette Falls. Four of these locks, located at the downstream end of the lock basin, connect that basin with the river below the dam, and a single guard lock joins the lock basin and the upper pool. The lock basin is about 1280 ft long and varies in width from 36 ft to 100 ft. The improvement plan for the Willamette Falls Locks project called for the replacement of the five old and inadequate navigation locks with two 440 ft by 56.08 ft modern locks, the widening and deepening of a connecting lock basin, the installation of a three-barrel siphon spillway for regulating the water-surface elevation within the lock basin, and the construction of a group of intake ports to supply water to the lock basin during highwater season. The general purpose of this study was to determine the adequacy of the features of the improvement plan as originally designed by means of tests performed with a 1:25-scale model. (Sims-ISWS)
W76-04123

SIDE-CHANNEL SPILLWAY AND OUTLET WORKS FOR LOOKOUT POINT DAM, MIDDLE FORK WILLAMETTE RIVER, OREGON, HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA 000 309, Price $5.50 in paper copy, $2.25 in microfiche.
Technical Report No. 24-1, November 1961. 102 p, 56 fig, 22 tab, 1 append.

Descriptors: *Model studies, *Hydraulic models, *Spillways, *Outlet works, Settling basins, Channel flow, Channels, Hydraulics, Concrete-lined canals, Conduits, Closed conduits, Valves, Turbulence, Structures, Hydraulic structures, Civil engineering.
Identifiers: *Lookout Point Dam(Ore), *Willamette River(Ore).

The Willamette River watershed, an area 90 mi wide and 165 mi long, is located in western Oregon. The first unit of the initial plan to develop the Middle Fork of the Willamette River was Lookout Point Dam. Model studies of the proposed uncontrolled side-channel spillway and outlet works for Lookout Point Dam were conducted to develop, by means of a 1:72-scale model of the spillway and a 1:25-scale model of the outlet works, satisfactory and economical designs for these elements. Particular attention was given to flow characteristics in the longitudinal channel and stilling basin for the side-channel spillway and to performance of the intake tower, outlet works, and stilling basin for the flood-control and power conduits. Although the spillway functioned satisfactorily as originally designed, excessive turbulence at the curved, 4-on1-sloped upstream end wall and standing waves downstream from the left abutment during the maximum design flow of 375,000 cfs (design discharge plus overcapacity of 132,000 cfs) indicated the need for improved performance of the channel. The turbulence and standing waves were largely alleviated by substituting a vertical end wall for the sloped end wall and eliminating a portion of the conical left abutment. (Sims-ISWS)
W76-04124

SPILLWAY AND STILLING BASIN FOR THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Informati Service, Springfield, Va 22161 as ADA 00 317, price $5.00 in paper copy, $2.25 in microfiche.
Technical Report No. 55-1, November 1964. 97 p, 54 fig, 22 tab.

Descriptors: *Model studies, *Hdydraulic models, *Spillways, *Settling basins, Dams, Baffles, Gates, Flow, Velocity, Current(Water), Hydraulics, Structures, Hydraulic structures, Civil engineering.
Identifiers: *The Dallas Dam(Ore Wash).

The concrete-gravity ogee spillway of the Dalles Dam contains twenty-three 50-ft-wide bays separated by 10-ft-wide crest piers. The crest is designed to pass 2,290,000 cfs under a total head of 61.3 ft; the crest shape is designed for 75% of maximum head or 46.0 ft. A 170-ft-long, hydraulic jump-type stilling basin, with one row of 9-ft-high baffle piers and a 13-ft-high end sill, will dissipate excess energy of spillway flows to and including the project design discharge of 2,290,000 cfs. The hydraulic performance of various elements for the spillway and stilling basin was studied in a 1:36-scale model. Tests of the original 27-bay spillway crest indicated that because spillway capacity was about 6% greater than was assumed in design computations, the number of crest bays could be reduced without causing undesirable flow conditions or pressure. Subsequent revisions and tests

resulted in the adoption of a 23-bay spillway that was satisfactory in all respects. The original energy dissipating facilities included a 220-ft-long, horizontal stilling basin 59 ft above mean sea level, two rows of baffle piers, and a 9-ft-high end sill. Model tests conducted with the 23-bay spillway crest disclosed that a 170-ft-long stilling basin at elev 55, with one row of baffle piers and a 13-ft-high end sill would be adequate. (Sims-ISWS)
W76-04125

OUTLET WORKS AND STILLING BASIN FOR COUGAR RESERVOIR, SOUTH FORK MCKENZIE RIVER, OREGON; HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA 000 323, Price $4.50 in paper copy, $2.25 in microfiche. Technical Report No. 87-1, May 1964. 60 p, 28 fig, 19 tab.

Descriptors: *Model studies, *Hydraulic models, *Outlet works, *Oregon, Settling basins, Fish barriers, Spillways, Dams, Reservoirs, Tunnels, Conduits, Channels, Flow, Hydraulics, Turbulence, Baffles, Structures, Hydraulic structures, Civil engineering.
Identifiers: *Cougar Dam(Ore), *McKenzie River(Ore), *Willamette River Basin(Ore).

Cougar Reservoir, a unit of the general comprehensive plan for flood control and other uses in the Willamette River Basin, will be located on South Fork McKenzie River, 4.4 mi above the junction of that stream with the McKenzie River, and about 42 mi east of the city of Eugene, Ore. The regulating outlet, stilling basin, and exit channel for Cougar Dam were studied in a 1:25-scale, fixed-bed model that reporduced a portion of the upper pool, 1057 ft of 13.6-ft-diam tunnel, the chute, stilling basin, and approximately 1100 ft of river bed and pertinent overbank topography downstream from the stilling basin. Results of the tests indicated that flow conditions and pressures in the tunnel, tunnel portal, and open chute of original design were satisfactory during the design discharge of 6000 cfs. Although a hydraulic jump existed in the 30-ft-wide stilling basin for all flows, excessive turbulence and wave action in the outlet channel showed that the stilling basin was too small. Flow conditions were acceptable after the development of a 50-ft-wide stilling basin that contained one row of five 4-ft-high by 5-ft-wide baffle piers and an 8-ft-high end sill. (Sims-ISWS)
W76-04126

THE DALLES DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATIONS.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as ADA 000 316, price $7.50 in paper copy, $2.25 in microfiche. Technical Report No. 52-1, June 1965. 179 p, 136 fig, 9 tab.

Descriptors: *Model studies, *Hydraulic models, *Dams, *Columbia River, Flow, Channel flow, Spillways, Velocity, Currents(Water), Channels, Structures, Hydraulic structures, Navigation, Powerplants, Fish ladders, Civil engineering.
Identifiers: *The Dalles Dam(Ore Wash).

Two hydraulic models were used during the studies. The most desirable layout for the principal structures, minimum excavation requirements, the adequacy of cofferdam and diversion plans, and the probable methods of project operations for initial and ultimate stages of development were investigated in a 1:80-scale general model. Data derived from the general model were used in operation of a 1:25-scale section model in which entrance losses within a typical powerhouse intake were evaluated for different approach flow directions, pier nose shapes, and trash rack designs. Three proposals for improvement of flow conditions at the downstream entrance to the navigation lock were investigated in the general model. A 400-ft-long extension, constructed at an angle of 10 degrees to the downstream end of the present guard wall, was most effective in enlarging the low-velocity area at the approach channel entrance. Tests in the 1:25-scale powerhouse intake model showed that the direction of approach flow had no significant effect on test unit discharge. Six trash rack designs and three pier nose designs were investigated. (Sims-ISWS)
W76-04127

ANTI-HEAVE PROTECTIVE SYSTEM,
Compagnie Generale pour les Developpements Operationnells des Richesses Sous-Marines, Paris (France). (Assignee)
J. E. Lamy.
US Patent No 3,921,408, 5 p, 23 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 940, No 4, p 1669, November 25, 1975.

Descriptors: *Patents, *Waves(Water), *Ocean waves, *Shore protection, Coastal structures, Breakwaters, Engineering structures, Energy dissipation.

A protective system against wave effects on port facilities and offshore facilities is described. It consists of a combination of bulky wall structure having a closed contour for an obstacle. The energy dissipating members comprise a number of beams supported in vertically spaced relation by a number of posts arranged in closed contour around the wall structure. The bulky wall structure is exposed to the impact of successive surges of the heave to induce along the wall structure ascending and descending motions of a mass of water of a thickness greater than a limit layer of water, and the beams are supported at a distance from the bulky wall structure sufficient to dip into the mass of water beyond the limit layer, the beams serving to slow down the ascending and descending motions and phase-shift them with respect to the heave. (Sinha-OEIS)
W76-04264

THE RESONANT INSTABILITIES OF LONG WAVES OBLIQUELY INCIDENT ON A BEACH,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-04300

A DIMENSIONLESS NUMBER FOR THE STUDY OF OPEN CHANNEL FLOW,
Regional Engineering Coll., Srinagar (India).
O. N. Wakhlu.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 515-522, September 1975. 3 fig, 12 ref.

Descriptors: *Dimensional analysis, *Open channel flow, *Flow, *Fluid mechanics, Water properties, Weirs, Hydraulics, Viscosity, Specific weight, Surface tension.
Identifiers: *Thin sheet flow, *Flow over weirs.

In problems of open channel flow, a combination of dimensional analysis and experimental measurement frequently offers the best path to a solution. Open channel flow is largely influenced by fluid properties such as specific weight, viscosity, and surface tension. The proposed dimensionless number combined the effects of these fluid properties. The dimensionless number was found to be significant in the solution of problems of thin sheet flow over steep slopes and flow over weirs; and it may prove useful in other problems of fluid mechanics. (Bender-ISWS)
W76-04303

CALCULATION OF FREE-SURFAC AERATED WATER FLOWS,
V. P. Troitskiy.
Fluid Mechanics-Soviet Research, Vol 4, No 2, 107-116, March-April 1975. 3 fig, 12 ref. Translat from Gidravlika i gidrotekhnika, No 17, p 56-6 1973.

Descriptors: *Fluid mechanics, *Hydraulic pr perties, *Open channels, *Free surfac *Roughness(Hydraulic), Head loss, Channel flo Flow, Hydraulics, Mathematical studies, Ae tion.
Identifiers: Self-aerated flow, Fictitious flow Reduced flows, Rectangular channels.

The relationship existing between the hydrau variables of steady, uniform, aerated water fl (in a rectangular or almost rectangular chann was described on the basis of experimental d obtained by others. The concepts of fictitious reduced flows were introduced. Data obtained channels having rough as well as smooth surfa were presented. The aerated flow was nomin subdivided into its different parts, and expressi were presented for each of these. A detai description was given of the applicability of different variations of the equations presented the different cases of aerated flow which can encountered in free-surface streams. The semi pirical equations derived were in satisfact agreement with experimental data. Cases in wh substantial simplification of the expressions possible were discussed. (Bender-ISWS)
W76-04306

TWO-DIMENSIONAL MASS DISPERSION RIVERS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5B.
W76-04309

DISPERSION OF MASS IN OPEN-CHAN FLOW,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2J.
W76-04311

INTERNATIONAL CONFERENCE ON DI REDUCTION,
Office of Naval Research, Boston, Mass.
A. D. Wood.
Available from the National Technical Info tion Service, Springfield, Va 22161 as ADA 784, $3.25 in paper copy, $2.25 in microfiche. London Conference Report C-10-74, Dece 12, 1974. 11 p.

Descriptors: *Drag, *Fluid mecha *Conferences, *Reviews, Polymers, Suspen Flow, Turbulent flow, Laminar flow, Model dies, Fluid friction, Hydraulics.
Identifiers: *Drag reduction.

The International Conference on Drag Redu was held September 4-6, 1974 at St. John's Co in Cambridge, England. The conference wa ganized by the British Hydromechanics Rese Association (BHRA), and paper presentation by invitation only. This report summarized principal papers of the conference, cover wide range of topics, such as: theory of poly drag reduction; tests of proposed correlation scaling theory; polymer degradation; effec surfactants, fibers, sediments, and compliant faces; applications to hydrofoils, turbomachi flow measurement, jets; shear stress reducti blood flow. Reasons for caution in any extra tions with theoretically-based drag-reduction mulas were cited, and the controversy whether this reduction is time-scale or length-dependent was discussed. (Sims-ISWS)
W76-04316

RIVER RUN-OFF CONTROL,
For primary bibliographic entry see Field 4A.
W76-04326

8C. Hydraulic Machinery

CAVITATION EROSION DAMAGE IN PUMPS.
AQUA, No 3, p 24, 1975.

Descriptors: *Cavitation, *Impellers, *Pumps, Fluid mechanics, Vortices, *Erosion, *Design, Operations, Bubbles, Aeration, Polymers, Equipment, Materials.
Identifiers: Gas bubbles.

Cavitation is a major problem in the design and operation of fluid handling equipment. Implosion of gas bubbles has the ability to destroy high speed pump impellers. One solution to the problem is the upgrading of the material of impeller construction. However, cavitation-resistant material is prohibitively expensive. Cavitation can be reduced by proper piping design, which specifically is aimed at the reduction of vortices. Work in the Netherlands has shown that cavitation can be reduced by injection of polymers or aeration. Small equipment users find it easier to accept cavitation since flow rates are lower and cavitation damage is not as severe. (Gass-NWWA)
W76-04048

YOUR DOWNHOLE MOTOR: HEY, WHERE'D IT GO.
Drilling - DCW, p 120-124, September, 1975. 9 fig.

Descriptors: *Drilling equipment, Rotary drilling, Drill monitors, Boreholes, Drill holes, Drilling.
Identifiers: *Directional drilling, Vertical inclination(Drilling), *Borehole inclination, *Downhole motors.

Directional drilling came about as an outgrowth of the need to keep boreholes vertical. In some localities, because of geology or drilling techniques some boreholes had inclinations as great as 38 degrees. Thus it became necessary to develop instruments for measuring borehole inclination, and direction of inclination. In the 1930's, evidence came to light that it was sometimes advantageous to allow the borehole to drift from the vertical especially if the angle and direction of drift can be controlled. Methods for getting from the surface location to the downhole target include: utilization of geologic characteristics of subsurface materials; adjustment of bit weight and rotary speeds; utilization of whipstocks and knuckle joints to mechanically alter the bit direction; utilization of drill collars, stabilizers and other drillstem components that achieve desired pendulum or fulcrum effects to alter hole course; or use of a downhole motor. Downhole motors do not require rotation of the drill string. They offer marked advantages in the control of hole angle and direction. Use of a downhole motor requires constant, or very frequent monitoring to assist the driller in keeping track of the bit's course. Two types of steering tools have been developed. One relies on electrical impulses, and the other uses pressure pulses to produce surface readings to describe bit course. The electrical impulse system makes use of an instrument that responds to gravitational pull and the earth's magnetic forces. The pressure pulse system makes use of a pendulum effect to determine bit course. (Gass-NWWA)
W76-04050

SPILLWAY PRESSURE HEAD INVESTIGATION, BONNEVILLE SPILLWAY DAM, BONNEVILLE, OREG.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04118

NAVIGATION LOCK FOR MCNARY DAM, COLUMBIA RIVER, OREGON AND WASHINGTON: HYDRAULIC MODEL INVESTIGATION.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04121

MODEL STUDY OF THE WILLAMETTE FALLS LOCKS, OREGON CITY, OREGON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
For primary bibliographic entry see Field 8B.
W76-04123

8E. Rock Mechanics and Geology

GEOMECHANICAL INVESTIGATIONS OF THE ROCK BASES OF HYDRAULIC STRUCTURES,
D. D. Sapegin, R. A. Shiryayev, N. M. Karpov, A. A. Nikitin, and L. P. Fradkin.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A002 991, $4.00 in paper copy, $2.25 in microfiche. Translation FTD-MT-24-2382-74, November 1974. 23 p, 14 fig, 25 ref. Translated from Izvestiya Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Gidrotekhnik, No 100, 1972, by Air Force Systems Command, Foreign Technology Division, Wright-Patterson AFB Oh.

Descriptors: *Rocks, *Rock mechanics, *Rock properties, *Dam foundations, Dam construction, Engineering geology, Foundation investigations, Dams, Damsites, Loads(Forces), Stress, Structural stability, Mechanical properties, Bearing strength, Strength of materials.
Identifiers: *USSR, Rock massifs.

During the construction of high concrete dams on rock bases, and also of underground workings with a large cross-section and high-pressure tunnels, the need arises for the fuller use of the supporting power of the rock massifs. In a number of cases the loads which appear during the building and operation of such constructions approach the maximum permissible. Further progress in the field of fuller use of structural properties of minerals is unthinkable at present without comprehensive and sufficiently large-scale investigations of deformability, strength and distributive ability of fractured rock massifs. In recent years considerable attention has been given to the questions of studying the behavior of rock massifs under a load. The data given on the behavior of rock massifs under a load testify to its complex nature and to the considerable influence of many factors on it. The analysis of these data also reveals the incomplete development even of the most important directions in the mechanics of rocks, which indicates the need for the further development of existing directions and methods of investigations of rock foundations of structures. Expansion and deepening of knowledge is needed in the fields of geomechanical properties of rocks, improvement of the methods for the determination of the stress-strain state, strength and stability of rock massifs, and the stability of structures raised on them. (Sims-ISWS)
W76-04323

8F. Concrete

OBTAINING SUCCESSFUL SQUEEZE-CEMENTING RESULTS,
J. L. Rike.
Drilling - DCW, p 107-116, September, 1975. 5 fig, 3 tab, 30 ref.

Descriptors: *Concrete mixes, *Cementing, Bentonite, Concrete additives, Slurries, Technology, Wells, Slurries, Cements, Well casing.
Identifiers: *Squeeze-cementing, Cement slurries

The technology of squeeze-cementing has been resaonably well defined in the literature, but popular practice of the art does not reflect the technology. Consistent and low-cost successful squeeze-cementing is possible, but an extensive training program is necessary. Habit and experience factors reflecting 50-year-old concepts must be revised. Myths about cement behavior must be replaced with valid concepts. Squeeze-cementing is an operation wherein cement slurry is forced under pressure to a specific point in a well. Uses include the exclusion of water, gas or oil from the producing formation; the recompletion from a depleted or an unwanted interval to a new interval; and the repair of casing or pipe failure. A high-pressure squeeze is utilized when all the perforation holes are filled with mud filter cake. The high-pressure fractures the formation to be squeezed. The fracturing operation removes mud filter cake from the perforation holes so that cement slurry can be placed in the perforation holes and dehydrated against the formation face. The low-pressure squeeze method is used when it is desirable to avoid any fracture of formation face. Low-pressure squeeze operations require smaller equipment than high-pressure operation. Squeeze operations are usually limited to Class A and Class E cements. Depending on requirements of the operation, extenders, retarders, dispersants and accelerators can be used to alter cement characteristics. (Gass-NWWA)
W76-04051

CONCRETE ABRASION STUDY, BONNEVILLE SPILLWAY DAM, BONNEVILLE, OREGON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. of Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 305, $4.00 in paper copy, $2.25 in microfiche. Report No 15-1, October 15, 1943. 39 p, 73 fig, 1 tab.

Descriptors: *Concretes, *Abrasion, *Bonneville Dam, *Columbia River, Dams, Spillways, Baffles, Structures, Hydraulic structures, Erosion, Scour, Laboratory tests, Silts, Concrete testing, Concrete mixes, Concrete structures, Concrete technology, Civil engineering.

The study was initiated in an effort to ascertain the cause of the erosion observed on the baffle piers and deck of Bonneville Spillway Dam on the Columbia River at Bonneville, Oregon. The purpose of the study was: (1) to determine if the erosion of the baffle piers and deck could be attributed to the scouring effect of the silt carried by the Columbia River, and (2) to determine the relative resistance to abrasion of various concrete mixes that dould be used to repair the eroded baffle piers and deck. It was found that abrasion of the abrasion of the concrete of Bonneville Dam by the Columbia River silt load should be considered as a contributing factor in the erosion of the baffle piers and deck of that structure. Concrete made with standard cement had a greater resistance to abrasion by silt-laden water than concrete made with high early-strength cement. (Sims-ISWS)
W76-04111

8G. Materials

NEW JOINT HARD FACING REDUCES CASING WEAR.
World Oil, Vol 181, No 5, p 78, October 1975, 2 fig.

Descriptors: *Casings, Abrasion, Mud, Well casings, Fluid friction, Joints(Connections).
Identifiers: Hardfacing, Casing plus, Reed method, Tungsten carbide, Ground 'smooth', Tool joints, Casing wear.

A new form of tool joint hard metal or hard facing promises reduced casing damage resulting from wear and abrasion in addition to protecting the tool joint. Drill strings with the new process on tool joints produce significantly less casing wear than any of the conventional methods. The new method, called the Reed Method, utilizes conventional hard metal application plus an additional layer of steel alloy. Fabrication requires only a slight additional undercut on the tool joint box end and one additional pass in the hard metal application stage. The product uses standard grainsize tungsten carbide applied with a steel alloy over which about 1/6 inch of additional alloy is deposited. Both layers are fused on by arc-welding machinery and in the process the mild steel forms a second alloy with a portion of the tungsten carbide present to yield a final surface hardness of over 50 Rockwell C. Both tool joints and casing are protected, and somewhat lower drilling torque is required because of the reduced dynamic friction. (Ukayli-NWWA)
W76-04047

STOP DRILL STRING CONNECTION FAILURE,
Exxon Co., Houston, Tex.
S. E. Loy, III, M. E. True, and P. D. Weiner.
Drilling - DCW, p 47-50, December, 1975. 3 fig, 2 tab, 4 ref.

Descriptors: *Drilling equipment, Rotary drilling, *Fatigue(Mechanics), *Failure(Mechanics), *Joints(Connections).
Identifiers: *Drill string connections, Drill collar joints.

Prevention of drill string connection damage and fatigue failure would result in the reduction in the cost of repairing damaged connections, the cost of fishing for lost drill string components or complete abandonment of well and replacement of drill strings. Laboratory tests were conducted to determine what could be done to eliminate or materially reduce drill string connection problems. Field tests were then made to substantiate the laboratory results. It was then concluded that: (1) Rotary shouldered drill collar connection life can be increased substantially by machining external stress relief grooves adjacent to the connection. The relief grooves outside diameter should be that required to reduce the moment of inertia of that section to 30 percent of the moment inertia of the drill collar; (2) Optimum rotary shouldered connection makeup is the torque required to prevent shoulder separation; (3) An analytical method of calculating optimum connection make-up torques was developed; (4) The large number of rotary shoulder connection types and sizes can be reduced if the design criteria described is utilized. This would result in a reduction in manufacturing costs, reduce the need for a large variety of inventory, and simplify crossover substitutions in field drilling operations. (Gass-NWWA)
W76-04049

DRILL PIPE FAILURES, CAUSES AND PREVENTIONS,
AMF Tuboscope, Inc., Houston, Tex.
W. M. Rogers.
Drilling - DCW, p 125-129, September, 1975. 4 fig, 2 tab.

Descriptors: *Drilling equipment, Drill monitors, Failure(Mechanics), *Fatique(Mechanics), *Corrosion, *Fluid friction, *Mechanical control, Piping systems(Mechanical).
Identifiers: *Drill pipe failure.

The causes of drill pipe failure can be categorized into four broad groups; fatigue, corrosion, mechanical damage, and wear. Fatigue is the most common cause of drill pipe failure. Fatigue ultimately leads to crack development near high load points and areas subjected to stress reversals. Corrosion is the pitting and notching of the drill pipe surface due to atmospheric or downhole environments. In recent years corrosion has been controlled by applying a plastic coating to the inside of the drill pipe. Mechanical damage consists of the outside surface cuts, gouges, hammer marks, slip area crushing and other similar anomalies caused by poor handling and operating practices. Wear is usually evidenced by broad area reduction in body wall thickness where the outside surface of the pipe comes in contact with the wall of the well bore. Drill pipe failures can be reduced by training personnel to properly handle and operate tools and drill pipe, to use the proper grade steel, maintain good mud pH control, frequently inspect the drill pipe and follow established guidelines. (Gass-NWWA)
W76-04052

DYNAMIC PROPERTIES OF SAN BERNARDINO INTAKE TOWER,
California Univ., Berkeley. Earthquake Engineering Research Center.
For primary bibliographic entry see Field 8A.
W76-04107

FIELD CALIBRATION OF FLOW MEASURING STRUCTURES,
Hydraulics Research Station, Wallingford (England).
W. R. White.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 429-447, September 1975. 12 fig, 2 tab, 9 ref.

Descriptors: *Flow measurement, Fluid mechanics, *Hydraulic structures, *Weirs, *Hydraulic similitude, *Calibrations, Model studies, Laboratory tests, Reliability, On-site tests, Measurement, Open channel flow.
Identifiers: United Kingdom, Compound weirs, Approach conditions, British standard requirements.

Three methods are used in determining performance characteristics of flow measurement structures in open channels: theoretical analysis of geometrically simple structures, laboratory calibration of precision models, and field calibration of existing structures. Five field calibrations were conducted in a program of field studies intended to evaluate laboratory model calibrations in performance prediction, to compare actual and theoretical ratings when simple weirs are compounded into a series, and to assess the importance of good flow conditions immediately upstream of a structure. In two cases of standard design structures, field calibrations confirmed laboratory ratings. Revisions were suggested for design requirements for other cases, and a method was recommended for calculation of flow over compound weirs. (Bender-ISWS)
W76-04302

8I. Fisheries Engineering

FISH PASSAGE FACILITIES, BONNEVILLE DAM: COLUMBIA RIVER, OREGON AND WASHINGTON.
Army Engineer Div. North Pacific, Bonneville, Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A000 409, $7.75 in paper copy, $2.25 in microfiche. Report No 66-1, April 1958. 203 p, 91 fig, 22 tab, 43 ref.

Descriptors: *Fish passages, *Fish ladders, *Bonneville Dam, *Columbia River, Fish, Fish barriers, Fish behavior, Fish migration, Fish populations, Structures, Hydraulic structures, Hyraulics, Costs, Operation and maintenance, Civil engineering, Biology.

Bonneville Dam is located on the Columbia River, between the states of Oregon and Washington, approximately 144 river miles from the Pacific Ocean. In 1933, when the planning for Bonneville Dam was begun , those who were responsible for the design of fish-passing facilities were confronted by many serious problems. The new project must include fishways of unprecedented size in order to protect and perpetuate a salmon run that was valued at more than $10,000,000 annually. Despite the pioneering nature of the undertaking, the facilities have functioned satisfactorily during more than 15 years of operation and have served as a guide for similar systems that have been incorporated at other projects. More than 15,115,000 fish of 38 species have been counted as they passed through the fish ladders at Bonneville Dam during the period May 1938 to November 1953. Numerous biological studies have been made to determine: (1) the apparent preferences of various species for specific flow conditions, as reflected by the rate of migration within the fish ladders; (2) the mortality of both upstream and downstream migrants; and (3) the over-all effects of the project upon the fishery. (Sims-ISWS)
W76-04112

FISH FACILITIES FOR MCNARY DAM COLUMBIA RIVER, OREGON AND WASHINGTON; HYDRAULIC MODEL INVESTIGATION
Army Engineer Div. North Pacific, Bonneville Oreg. Div. Hydraulic Lab.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A0 311, $7.75 in paper copy, $2.25 in microfich Technical Report No 30-1, June 1960. 218 p, 1 fig, 13 tab, 2 append.

Descriptors: *Model studies, *Hydraulic mode *Fish ladders, *Columbia River, Fish, F passages, Fish barriers, Fish migration, Dan Structures, Hydraulic structures, Hydraulic p perties, Civil engineering.
Identifiers: *McNary Dam(Wash Ore).

McNary Dam is located approximately 292 ri miles above the mouth of the Columbia Riv Model investigations of fish-passing facilities McNary Dam were concerned with the proba effects of the various structures on fish mig tions. Currents in the river adjacent to the fishv entrances and powerhous collection systems, f conditions within the fish ladder structures, pressures within the auxiliary water supply c duits and pipe lines were of particular inter Seven models were used during the investigati (1) a general model that reproduced to a scal 1:100 all features of the project; (2) a secti spillway model that reproduced to a scale of an auxilliary water supply conduit and its mani outlet; (3) two sectional models that reproduce a scale of 1:16 the downstream entrances, aux ry water supply systems and typical sections o Washington fish ladder; (4) two sectional mo that reproduced to a scale of 1:10 a typical d sion chamber and its appurtenant water supply piping; and (5) a sectional model, in which reproduced to a scale of 1:1 the inside wall typical diffusion chamber within the powerh collection system. (Sims-ISWS)
W76-04113

FISH FACILITIES, THE DALLES D COLUMBIA RIVER, OREGON AND WASH TON: HYDRAULIC MODEL INVESTIGATI
Army Engineer Div. North Pacific, Bonne Oreg. Div. Hydraulic Lab.
Available from the National Technical Info tion Service, Springfield, Va 22161 as AD- 320, $6.75 in paper copy, $2.25 in micro Technical Report No 61-1, June 1965. 151 p, 14 tab.

Descriptors: *Model studies, *Hydraulic m *Fish passages, *Columbia River, Dams, tures, Hydraulic structures, Engineering

ures, Fihs ladders, Fish migration, Spillways, Powerplants, Civil engineering.
dentifiers: *The Dalles Dam(Wash and Ore).

The Dalles Dam, located approximately 3 miles pstream from the city of The Dalles, Oregon, pans the Columbia River 192.5 miles from the ver mouth. The project is one unit in a system of ultiple-purpose reservoirs on the Columbia River or flood control, power, irrigation, navigation, nd other benefits. The problems involved in the esign of facilities to insure the safe upstream assage of anadromous fish at The Dalles Dam ere very complex. Seven hydraulic models, gether with full-scale apparatus for testing the ffects of rapid decreases of pressure on fish that ass underneath the spillway gates, were used to heck the adequacy of designs for the respective ements and to effect revisions if necessary. In ldition, full use was made of information gained om operation of Bonneville Dam, McNary Dam, d other major projects in the Pacific Northwest. ims-ISWS)
76-04117

N IMPROVED CAGE DESIGN FOR USE IN ULTURING CHANNEL CATFISH,
xas Agricultural Experiment Station, College ation.
R. Kelley, Jr.
og Fish-Cult. 35(3): 167-169. Illus. 1973.

escriptors: *Channel catfish, Design, *Fish reduction, Costs, *Design criteria.
entifiers: *Fish cages.

ges were designed for use in experimental and oduction culture of fishes. Criteria associated th design were: durability, cost, and simplicity construction. Cages were constructed of welded re fabric and angle-iron frames.--Copyright 74, Biological Abstracts, Inc.
76-04424

ADROMOUS FISHERIES CONSERVATION EVELOPMENT AND ENHANCEMENT.
tional Marine Fisheries Service, Washington, C.
r primary bibliographic entry see Field 6E.
76-04448

LANTIC BLUEFIN TUNA (THREATENED ECIES--FISH).
tional Oceanic and Atmospheric Administra-n, Washington, D.C.
primary bibliographic entry see Field 6E.
6-04456

MANPOWER, GRANTS AND FACILITIES

. Research Facilities

E SWISS FEDERAL RATING STATION FOR RRENT METERS. THE NEW STATION OF 2,
genoessisches Amt fuer Wasserwirtschaft, n (Switzerland).
Bircher.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as AD-A000 $4.00 in paper copy, $2.25 in microfiche. y Engineer Division, North Pacific, Bon-lle, Oregon, April 1965. 33 p, 38 fig, 24 ref. slated from Swiss Federal Water Service ication No 41, 1956.

criptors: *Facilitieis, *Current meters, ibrations, Laboratories, Flumes, Testing, ing procedures, Equipment, Instrumentation.
tifiers: *Switzerland.

This publication was intended to communicate the problem of planning and operating a modern current meter rating station. Although conditions vary from place to place, this information may be useful. In 1896, the first Swiss Current Meter Rating Station at Papiermuehle, near Berne, was put into service. The studies for a new rating station began in the early thirties, but they were delayed during World War II. The final project was accepted in 1948 and the new station was built during 1950-52. In view of the foundation problems for a 140 m long flume, several possible locations in the vicinity of Berne were considered. The ultimate decision was to build it parallel to the old flume because little extra consolidation was necessary for satisfactory foundation. Several meters had been rated in the old flume and, without having been used in the meantime, were recalibrated in the new flume. There was good agreement between the old and new ratings. Epper's hump, inherent to the old flume, was completely absent. Detailed regulations concerning the meter ratings have been established. These regulations are based on all available data, comply with the principles stated above, and guarantee reliable results. (Sims-ISWS)
W76-04327

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

A MULTIDISCIPLINARY APPROACH TO SOLVING COMMUNITY WATER PROBLEMS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 10D.
W76-04391

10C. Secondary Publication And Distribution

IRRIGATION RETURN FLOW, A BIBLIOGRAPHY.
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5B.
W76-04230

WATER POLLUTION CONTROL DIRECTORATE PUBLICATIONS.
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W76-04253

10D. Specialized Information Center Services

A MULTIDISCIPLINARY APPROACH TO SOLVING COMMUNITY WATER PROBLEMS,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sharpe, C. S. Oliver, and J. C. Frey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-249 814, $5.00 in paper copy, $2.25 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Information Report No 76, December 1975. 76 p, 6 tab, 5 append. OWRT A-031-PA(1). 14-31-0001-5038.

Descriptors: Water resources, *Decision making, Publications, *Communication, *Pennsylvania, Libraries, *Information exchange, *Water Resources Institute, Community development.
Identifiers: *Technology transfer, *Cooperative Extension Service, *Research results, News releases, Video tapes, Radio, Television, Clipping service.

The rapid integration of water resources research results into water resources management decision making has historically been difficult to achieve. This research attempted to delineate and describe methods and procedures useful in the accomplishment of water resources technology transfer by Water Resources Research Institutes. The Cooperative Extension Service was evaluated as a mechanism for technology transfer through case history studies of actual transfer attempts. The effectiveness of various media including news releases, films, video tapes, radio and television programming and popularized publications were subjectively evaluated. Results indicate that there are many advantages in working with the Cooperative Extension Services, although other organizations in particular Watershed Associations, Conservation Districts, local libraries and environmental regulatory agency personnel also show potential as transfer agents. Subscription to newspaper clipping services also proved to be an effective method of discerning community water problems on a regular basis. Pennsylvania's water resources problems and obstacles to their solution are enumerated. (Sink-Penn State)
W76-04391

BEN B. EWING
MAY 31 1974
RECEIVED
MAY 31 1974

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 10
MAY 15, 1974

W74-04851 -- W74-05400

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 7, NUMBER 10
MAY 15, 1974

W74-04851 -- W74-05400

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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06 WATER RESOURCES PLANNING
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09 MANPOWER, GRANTS, AND FACILITIES
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

CLUSTERING IN SUPERCOOLED WATER,
Cryobiology Research Inst., Madison, Wis.
D. H. Rasmussen, and A. P. MacKenzie.
Journal of Chemical Physics, Vol 59, No 9, p 5003-5013, Nov. 1, 1973. 10 fig, 1 tab, 29 ref.

Descriptors: *Supercooling, *Water properties, *Water structure, *Specific heat, *Density, *Heavy water, Theoretical analysis, Cooling, Temperature, Thermal capacity, Thermal properties, Molecular structure, Physical properties, Physicochemical properties, Deuterium.

The specific heats and densities of supercooled water and heavy water have been measured from the respective melting points to the respective homogeneous nucleation temperatures. The calorimetric measurements indicate structural contributions to the differences between the specific heats of the liquids and the corresponding crystals. These 'structural specific heats' are exponential functions of the supercooling. The results are interpreted in terms of Frenkel's heterophase fluctuation theory. It is concluded that, during supercooling, water molecules tend to form icelike clusters incorporating six or more monomers. (Brown-IPC)
W74-05251

2. WATER CYCLE

2A. General

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-04922

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-04973

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
D. W. Green, E. C. Pogge, R. M. Knapp, B. Schorn, and C. Stanford.
Available from the National Technical Information Service as PB-229 501, $5.75 in paper copy, $1.45 in microfiche. University of Kansas Center for Research, Inc., Lawrence, Completion Report, August 1973. 193 p, 39 fig, 7 tab, 38 ref, 2 append. OWRR C-2039(No 3357) (i). 14-31-0001-3357.

Descriptors: *Computer models, *Groundwater basins, *Streamflow forecasting, *River basins, *Surface-groundwater relationships, Groundwater recharge, Groundwater, Base flow, Aquifers, Routing, Hydrologic budget, Soil water movement, Hydrologic cycle, Model studies, Water resources development, *Simulation analysis, *Kansas, Water management(Applied).
Identifiers: Numerical modeling, Stream-aquifer interaction, Stream basin, Surface-groundwater interactions, Basin evapotranspiration, *Little Arkansas River basin(Kan).

A digital computer model was developed to describe the hydrology of a stream basin and associated aquifer. The model simulates both surface-water and ground-water phases and their interaction. Input to the model includes precipitation, climatic conditions, boundary and initial conditions, and basin constants. Provision has been made for modeling withdrawals from both groundwater and surface waters for consumptive use. The computer output includes streamflow hydrographs at selected points, groundwater levels, and summaries of important moisture fluxes. The model was successfully tested by using it to simulate the hydrologic behavior of the Little Arkansas River basin in south-central Kansas. The model was used to simulate the 25 years from 1946 to 1970. The results of the simulation were evaluated by comparing the calculated daily discharges to actual streamflow data and the computed groundwater levels to observation well data at sixteen observation sites for the 25-year period. The groundwater heads at the end of 1970 were also compared to a piezometric survey completed in the spring of 1971. The simulation results were considered quite good. Complex hydrologic features in the groundwater were maintained within the accuracy of the simulator and the time response of the groundwater heads in the observation wells closely followed the actual behavior of those wells. With the exception of extreme weather conditions, the computed basin discharges approximated the behavior of the actual basin.
W74-04984

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
For primary bibliographic entry see Field 6E.
W74-05076

PROBLEMS IN HYDROLOGIC FORECASTING (VOPROSY GIDROLOGICHESKIKH PROGNOZOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-05141

COMPOSITIONAL MODELING OF HYDROGRAPHS (KOMPOZITSIONNOYE MODELIROVANIYE GIDROGRAFOV),
G. A. Grinevich, N. A. Petelina, and A. G. Grinevich.
Izdatel'stvo 'Nauka', Moscow, 1972. 183 p.

Descriptors: *Hydrographys, *Runoff, *Floods, *Model studies, *Statistical methods, Correlation analysis, Histograms, Probability, Stochastic processes, Markov processes, Variability, Fluctuations, Seasonal, Wet seasons, Dry seasons, Distribution patterns, Flood waves, Flood discharge, Curves, Equations.
Identifiers: USSR, Nomograms.

Processes in the grouping of wet and dry years on rivers are examined, and improved method of statistically describing and of modeling long-term and seasonal fluctuations of runoff are described. Possibilities are discussed for obtaining and considering additional information for more accurate estimation of the probability of development of different (including extremal) hydrologic situations on rivers, such as catastrophic floods, groups of dry and wet years, and runoff deficits. (Josefson-USGS)
W74-05146

2B. Precipitation

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2L.
W74-04875

BOMEX RAINY DAY ANALYSIS,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
G. W. Elliott.
Technical Memorandum EDS BOMAP-10, July 1973. 9 p, 5 fig, 2 ref.

Descriptors: *Salinity, *Mixing, *Sea water, *Rainfall intensity, Data collections, Atlantic Ocean, Oceanography, *Precipitation intensity.

An investigation was made during the Barbados Oceanographic and Meteorological Experiment (BOMEX) in 1969 to evaluate the possibility of determining total precipitation from the change in salinity or temperature at the ocean surface. Salinity-temperature-depth (STD) soundings were taken at 3-hr intervals during periods of no rain, and at 5- to 6-min intervals during periods of rain. During periods of no rain, salinity regularly fluctuated by 0.015%. Fluctuations of this magnitude are likely to obscure possible salinity depressions due to rainfall. No rainfall-related long-term salinity depressions were evident. Many sharp, short-term depressions of salinity, on the order of 10 to 45 min, however, were observed during periods of rainfall. (Knapp-USGS)
W74-04921

THE ASH WEDNESDAY EAST COAST STORM, MARCH 5-8, 1962. A HINDCAST OF EVENTS, CAUSES, AND EFFECTS,
National Engineering Science Co., Washington, D. C.
For primary bibliographic entry see Field 2J.
W74-04969

HURRICANE STUDIES FOR NARRAGANSETT BAY,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8B.
W74-04970

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
For primary bibliographic entry see Field 2L.
W74-04971

RAINFALL INTENSITIES IN ISRAEL,
Z. Schein, and N. Buras.
Israel Journal of Earth-Sciences, Vol 22, p 15-30, 1973. 3 fig, 5 tab, 10 ref.

Descriptors: *Depth-area-duration analysis, *Depth-area curves, *Rainfall, Arid lands, Distribution patterns, Probability, Frequency analysis, Hyetographs, Hydrologic data, Data collections, Climatic data, *Arid climates.
Identifiers: *Israel.

Rainfall-depth-duration-probability relations and regional rainfall distributions were developed for Israel from 17 recording gages with 14-33 years of records. Monthly probabilities for daily and shorter duration rainfall were estimated from five selected stations with long-term records. (Knapp-USGS)
W74-05123

LAKE MICHIGAN SNOW SQUALLS INCREASE ANNUAL PRECIPITATION IN THE UDELL HILLS,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
D. H. Urie.
Available from NTIS, Springfield, Va. 22151, PB-223 489, Price $2.75 printed copy; $1.45 microfiche. Forest Service Research Note NC-120, 1971. 4 p, 3 fig, 1 tab, 4 ref.

Descriptors: *Snowfall, *Precipitation(Atmospheric), *Orography, *Lake Michigan, Topography, Water balance.
Identifiers: *Udell Hills(Mich).

Snow squall concentration in the Udell Hills of Michigan illustrates the effects of minor topographic features and the proximity of Lake Michigan on the seasonal distribution of precipitation. Water budget studies in areas of similar topography can use the relationships developed in this study. (Knapp-USGS)
W74-05124

A THEORY OF MICROWAVE APPARENT TEMPERATURE OVER THE OCEAN,
Kansas Univ./Center for Research, Inc., Lawrence.
S. T. Wu, and A. K. Fung.
Available from NTIS, Springfield, Va. 22151, NASA CR-2329, Price $4.50 (domestic); $7.00 (foreign) $1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2329, November 1973. 146 p, 35 fig, 11 tab, 127 ref, append. NASA Contract NAS 1-10048.

Descriptors: *Microwaves, *Water temperature, *Remote sensing, Waves(Water), Meteorological data, Data collections, Weather data, Winds, Oceans.
Identifiers: *Microwave radiometry.

In the microwave region combined active (scatterometer) and passive (radiometer) remote sensors over the ocean show promise of providing surface wind speeds and weather information. Several approaches to the problem are now available, but none satisfactorily predict both the scattering and emission characteristics of the sea surface. The disagreement may be accounted for at least in part by the use of an improper surface model. A composite surface scattering theory is investigated as a more realistic approach. A two-scale scattering theory was extended to compute the emission and scattering characteristics of ocean surfaces. The effect of the small irregularities upon the scattering characteristics of the large undulations is included by modifying the Fresnel reflection coefficients; the effect of the large undulations upon those of the small irregularities is accounted for by averaging the scattering cross sections of the small irregularities over the surface normals of the large undulations. The wind dependent parameters of the theory are established by comparing the emission characteristic with measurement and by using measured sea slope data. Improved agreement with measured scattering and emission results over a single-surface theory is demonstrated by the composite theory. The effects of clouds and rain on the radiometer and scatterometer observations were also investigated using horizontally stratified model atmospheres with rough sea surfaces underneath. For heavy rainfall rates the effects of scattering on the radiative transfer process are included. Clouds and rains cause the radiometer to lose contact with the surface when clouds or rain intervene. However, the rise of apparent temperature can be used to compute the atmospheric attenuation and the scatterometer measurement can be corrected accordingly. (Knapp-USGS)
W74-05126

CHEMICAL COMPOSITION OF MONSOON RAINWATER OVER CHANDIGARH IN 1971,
Central Groundwater Board, Faridabad(India).
B. K. Handa.
Indian Geohydrology, Vol 9, No 1, p 31-37, June 1973. 2 tab, 23 ref.

Descriptors: *Water chemistry, *Rainfall, *Chemistry of precipitation, Water quality, Provenance.
Identifiers: *India(Chandigarh).

In rainwater over Chandigarh, India, bicarbonate ions and calcium ions are pre-eminent, so that the rainwater is primarily of the CaHCO3 type. The concentration of potassium ions is quite low but sometimes exceeds that of sodium ions. The weight ratio SO4/Cl also in some cases exceeds unity. Although the chloride ions are supposed to be mainly of marine origin, a comparison of the chemical analysis data of seawater with that of rainwater over Chandigarh shows that there is little resemblance between the two. However, the river water generally shows a great similarity to rainwater in the relative proportions of the various ions. The chemical composition of the rainwater varies quite irregularly. (Knapp-USGS)
W74-05130

EFFECT OF HYDROMETEOROLOGICAL CONDITIONS ON TIME OF ICE FORMATION ON RIVERS IN THE BALTIC SEA REGION AND BELORUSSIA (VLIYANIYE GIDROMETEOROLOGICHESKIKH USLOVITY NA SROKI POYAVLENIYA L'DA NA REKAKH PRIBALTIKI I BELORUSSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05143

20-24 YEAR CYCLE IN THE MARCH OF ATMOSPHERIC PRECIPITATION AND ITS RELATION TO AIR CIRCULATION PATTERNS (TSIKL 20-24 GODA V KHODE ATMOSFERNYKH OSADKOV I YEGO SVYZA' S OSOBENNOSTYAMI ATMOSFERNOY TSIRKULYATSII),
Leningrad State Univ. (USSR)
L. A. Kudryavtseva.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 87-93, March 1973. 1 fig, 5 ref.

Descriptors: *Precipitation(Atmospheric), *Air circulation, *Cycles, *Meteorology, Cyclones, Anticyclones, Correlation analysis, Forecasting, Curves.
Identifiers: *USSR.

Results are presented of a study of a 20-24 year cycle of precipitation over the USSR and of its relation to air circulation patterns. A 20-24 year cycle in the march of precipitation is manifested over a relatively large expanse of the USSR during warm and cold periods of the year and determines the general moisture background of these areas. The appearance of a 20-21 year cycle in the march of precipitation during the warm period over central regions of the Urals and West Siberia is due to regeneration processes and is expressed by the number of days with precipitation greater than or equal to 10.0 mm in a 24-hour period. The 20-24 year cycle can be used to prepare a long-term precipitation forecast. (Josefson-USGS)
W74-05149

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
J. C. Rodda.
Report No 17, A WMO contribution to the International Hydrological Decade (IHD), 1973. 278 p.

Descriptors: *Rain gages, *Instrumentation, *Precipitation gages, *Bibliographies, Abstracts, Measurement.

Precipitation measurement is the subject of this bibliography. Few, if any, entirely new instruments and techniques are featured in this report. Perhaps the most novel are the optical devices that look at the falling drops and flakes, but there is far greater emphasis on the development of existing methods. The measurement of snow is a problem that still remains to be solved, and this also applies to the other less common forms of precipitation. A large number of studies have been conducted to investigate the sources of error in precipitation measurement, the majority being concerned with those affecting the assessment of rain. (Knapp-USGS)
W74-05169

STORM OF MAY 5-6, 1973, IN THE DENVER METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W74-05171

2C. Snow, Ice, and Frost

THE EFFECT OF IMPURITIES ON THE MECHANICAL PROPERTIES OF ICE SINGLE CRYSTALS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
T. Nakamura, and S. J. Jones.
Scientific Series No 24, 1973. 29 p, 45 fig, 3 tab, 32 ref.

Descriptors: *Ice, *Cryology, *Mechanical properties, *Stress strain, Crystallography, Aqueous solutions, *Tensile stress, Tensile strength, Ions.

Constant strain-rate tensile tests were carried out on single crystals of ice doped with various impurities including HF, HCl, HBr, NH4F, NaF, KF, NaOH, H2O2, NH4OH, and He. The tests were carried out in the temperature range of -5 deg C to -53 deg C. HF-doped crystals showed a softening effect in this temperature range as well as in the lower temperature range previously reported. HCl-doped crystals showed a less pronounced softening effect than HF. H2O2-doped crystals showed a softening effect at -26 deg C, one He doped crystal showed a hardening effect at -15 deg C, and the other impurities had no apparent effect. An activation energy for pure ice of 18 plus or minus 2 kcal/mole was deduced; for HCl-doped ice an activation energy of 12 plus or minus 1 kcal/mole and 13 plus or minus 2 kcal/mole were found using two methods of analysis. A power law relationship between stress and strain-rate was found to hold for pure and HCl-doped crystals with n = 1.73 plus or minus 0.07. The distribution of fluorine and chlorine ions in the crystal showed marked increases in ion concentration towards the surface. (Knapp-USGS)
W74-04914

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W74-04918

PHYTOMASS RESERVES IN SOME TYPES OF TUNDRA FROM THE NORTHERN OB RIVER RELATED AREA, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2I.
W74-04940

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF FROZEN SOIL AND ON EROSION PROCESSES (VLIYANIYE LUNKOVANIYA ZYABI NA VODNO-FIZICHESKIYE SVOYSTVA MERZLOY POCHVY I PROTSESSY EROZII),
For primary bibliographic entry see Field 2G.
W74-05019

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.

For primary bibliographic entry see Field 4A.
W74-05104

LAKE MICHIGAN SNOW SQUALLS INCREASE ANNUAL PRECIPITATION IN THE UDELL HILLS,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2B.
W74-05124

LONG-RANGE FORECAST OF DURATION OF ICE PHENOMENA ON THE DANUBE RIVER (DOLGOSROCHNYY PROGNOZ PRODOLZHITEL'NOSTI LEDOVYKH YAVLENIY NA R. DUNAYE),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
T. N. ,Makarevich, Z. A. Yefimova, and L. K. Savina.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 3-24, Leningrad, 1972. 7 fig, 4 tab, 45 ref, append.

Descriptors: *Ice, *Ice cover, *Forecasting, *Meteorology, Atmosphere, Air temperature, Atmospheric pressure, Air circulation, Synoptic analysis, Seasonal, Probability, Histograms, Curves.
Identifiers: *USSR(Danube River).

Problems relating to forecasts of the degree of severity of winters and of the duration of ice phenomena on the Danube River were investigated. Studies were made of the recurrence and probability of duration of ice phenomena for 4 unregulated reaches of the Danube from Bratislava to the river mouth between 1900 and 1968. The duration of ice phenomena on the Danube is closely related to air temperature in winter in Central Europe. Long-range forecast procedures were based on data on changes in the pressure field over Canada (1949-67) using the index of zonal circulation and on ground pressure data using the coefficient of expansion of pressure fields into natural components (1938-67). Forecast procedures based on use of the index of zonal circulation are preferred, and solutions obtained for the Lower Danube are more accurate than those for the Middle Danube because of the regime characteristics of the river's lower reaches and the greater continentality of the part of the basin. (See also W74-05141) (Josefson-USGS)
W74-05142

EFFECT OF HYDROMETEOROLOGICAL CONDITIONS ON TIME OF ICE FORMATION ON RIVERS IN THE BALTIC SEA REGION AND BELORUSSIA (VLIYANIYE GIDROMETEOROLOGICHESKIKH USLOVITY NA SROKI POYAVLENIYA L'DA NA REKAKH PRIBALTIKI I BELORUSSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. Ya. Alekseyenko.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 57-67, Leningrad, 1972. 3 fig, 4 tab, 8 ref.

Descriptors: *Ice, *Ice cover, *Rivers, *Meteorology, Atmosphere, Air circulation, Air temperature, Discharge(Water), Water temperature, Heat balance, Heat transfer, Seasonal, Correlation analysis, Forecasting, Equations.
Identifiers: *Baltic Sea Region, *USSR(Belorussia), Heat exchange.

The influence of major items in the hydrologic and meteorological regimes affecting the date at which ice starts to form on rivers in the Baltic Sea Region and Belorussia was investigated for development of improved long-term ice-growth forecasts. Studies were made of the relation of dates of ice formation to air temperature, stream discharge, water temperature, heat discharge, and total heat exchange between water and the atmosphere. Average monthly air temperature was used for 1901-50 for eastern regions (Velizh, Vitebsk, Daugavpils) and for 1903-50 for western regions (Vilnius, Yelgava), and average 10-day air temperature was used for 1937-67 (for Velizh and Vitebsk) and for 1946-67 (for Daugavpils and Grodno). To determine dates of ice formation, heat transfer from the water surface to air and air circulation processes must be considered. (See also W74-05141) (Josefson-USGS)
W74-05143

FORECASTING THE MAXIMUM LEVEL OF ICE JAMS ON THE SEVERNAYA DVINA RIVER AT ARKHANGEL'SK (PROGNOZ MAKSIMAL'NOGO ZATORNOGO UROVNYA VODY R. SEVERNOY DVINY U G. ARKHANGEL'SKA),
Godsudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. A. Nezhikhovskiy, and N. P. Sakovskaya.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 68-83, Leningrad, 1972. 5 fig, 4 tab, 8 ref.

Descriptors: *Ice, *Ice cover, *Ice jams, *Forecasting, Ice breakup, Discharge(Water), Inflow, Floods, Flood waves, Water levels, Profiles, Correlation analysis, Curves, Equations.
Identifiers: The maximum level of ice jams in the estuarine region of the Severnaya Dvina River, especially near Arkhangel'sk, is determined primarily by the rate of water discharge during the period of ice breakup on the river. A close empirical relation is established between the maximum level of ice jams and both the water discharge of the river at Abramkovo village and lateral inflow in the Abramkovo-Arkhangel'sk reach on the same day. The forecast is timed to coincide with the last day of thick, continuous ice cover at Abramkovo and can be made, on the average, 5-7 days in advance. (See also W74-05141) (Josefson-USGS)
W74-05144

THEORY OF METAMORPHISM OF WET SNOW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck.
Research Report 313, December 1973. 11 p, 7 fig, 13 ref.

Descriptors: *Snow, *Crystal growth, *Cryology, Avalanches, Melting, Freezing, Snowmelt, Permeability, Porosity, Temperature.
Identifiers: *Snow metamorphism.

Metamorphism by grain growth, bond growth, and densification of wet snow are described in terms of the distribution of equilibrium temperature in the snow matrix. At high water saturations the equilibrium temperature increases with grain size; hence, small particles melt away as large particles grow. Melting also occurs at the intergrain bonds, causing a low strength and rapid densification. At low saturations the equilibrium temperature is determined by the capillary pressure and the particle sizes have only a second order effect. Therefore, grain growth proceeds slowly and, even at large overburden pressures, no intergrain melting occurs. At low saturations the water tension acts through a finite area, thus large attractive forces exist between the grains, and the strength of the snow matrix is large. The behavior of wet snow governs the release of wet-snow avalanches and water runoff through seasonal snowpacks. The performance of oversnow vehicles and construction on snow covers are matters of practical necessity involving wet snow as a material. (Knapp-USGS)
W74-05154

THE AIDJEX LEAD EXPERIMENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
C. A. Paulson, and J. D. Smith.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 1-8, January 1974. 1 fig, 5 ref.

Descriptors: *Sea ice, *Movement, Currents(Water), Winds, Navigation, Heat transfer, Freezing, Convection, Heat flow, *Alaska.
Identifiers: Leads(Icepacks).

To study sea-ice movement, an open-lead experiment is planned. Atmospheric and oceanic observations are made at a newly created lead offshore from Barrow, Alaska. The atmospheric observations attempt to measure the vertical flux of heat and determine its relation to air-sea temperature difference, fetch, height, and wind speed. The oceanic observations seek to determine the characteristics of the density-driven convection in the vicinity of a lead by measuring the oceanic velocity and density fields. (Knapp-USGS)
W74-05158

SUBSURFACE EDDIES IN THE ARCTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
K. L. Hunkins.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 9-36, January 1974. 17 fig, 1 tab, 11 ref. ONR Contract N00014-67-A-0108-0016.

Descriptors: *Eddies, *Arctic Ocean, *Ocean currents, Currents(Water), Mixing, Salinity, Density stratification, Turbulence, Vortices.

Transient undercurrents associated with eddies in the Arctic Ocean were observed at depths between 50 and 300 m. The velocity profile was parabolic with a maximum of 40 cm/sec at 150 m. A distortion of the salinity and temperature field accompanied these currents, and gradient equilibrium was closely approached in each case. The eddies persisted for several days. They were 10 to 20 km in diameter and were separated by 20-50 km. The eddies have their origin in the instability of the basic baroclinic current. A large-scale horizontal salinity gradient is produced by global conditions of oceanic precipitation-evaporation and modified by wind conditions. The currents accompanying such a density gradient are not stable but rather lead to growing disturbances. As the disturbances amplify, the potential energy of the horizontal density gradient is converted into the kinetic energy of eddies. (Knapp-USGS)
W74-05159

A RELATION BETWEEN THE POTENTIAL ENERGY PRODUCED BY RIDGING AND THE MECHANICAL WORK REQUIRED TO DEFORM PACK ICE,
Washington Univ., Seattle. Div. of Marine Resources.
D. A. Rothrock.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 45-51, January 1974. 5 ref.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: Ice mechanics.

The rate of production of potential energy by mechanical processes that change the thickness distribution of sea ice provides a useful lower bound for the rate of work by the two-dimensional stress in pack ice. A formal relation is derived between the plastic work and the increase of potential energy due to all ridging processes represented by the redistribution function. Since

the redistribution function can depend in general on twotdimensional strain rates, the extension to the two-dimensional case is included without further derivation. (Knapp-USGS)
W74-05160

REDISTRIBUTION FUNCTIONS AND THEIR YIELD SURFACES IN A PLASTIC THEORY OF PACK ICE DEFORMATION,
Washington Univ., Seattle. Div. of Marine Resources.
D. A. Rothrock.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 53-81, January 1974. 22 fig, 9 ref.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Ice mechanics.

A large-scale area of pack ice contains ice from zero to many meters thick. As the pack ice deforms, thin ice is ridged into thicker ice, in a way that depends on the strain rate and the instantaneous thickness distribution. The rate of this process is assumed to be proportional to the rate of deformation, and fixed proportions (by area) of the thinner ice are assumed to be ridged into ice of known thicknesses. The amount of this ridging is assumed to depend on the angle whose tangent is the ratio of the shearing rate to the divergence rate. The potential energy required to perform this ridging is equated to the plastic work performed by the horizontal ice stress. The ice is assumed to behave plastically. For stresses inside a yield surface, the ice is rigid. Stresses on the yield surface cause the ice to flow by the rule that the strain rate tensor is normal to the yield surface in stress space. The size of the yield surface depends on the thickness distribution. (Knapp-USGS)
W74-05161

DIMENSIONLESS STRENGTH PARAMETERS FOR FLOATING ICE SHEETS,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
R. R. Parmerter.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 83-95, January 1974. 5 fig, 8 ref. NSF Grant GV-28807.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Ice mechanics.

The equations governing a floating ice sheet subjected to vertical loading were studied in dimensionless form. In thin sheets, the ratio of transverse shear to bending stress is proportional to the fourth root of thickness, so that bending stress dominates. Thus, simple plate theory, which ignores the deformation due to shear, may be used for ice sheets up to several meters thick. The bending stress in the sheet may be incorporated into a dimensionless strength parameter that depends on the functional form of the loading and Poisson's ratio. Where the loading is one dimensional, the strength parameter depends only on the form of the loading. The more complex problem in which in-plane forces interact through the vertical deformations to create additional loading was also studied. This class of problems includes problems of elastic buckling. The problem of the rafting of ice, in which one sheet overrides another without breaking, is an example. The stress parameter is calculated as a function of the geometry of the rafting sheet. If the actual strength of the ice is such that the strength parameter falls below the solution curve, the ice will break before it rafts. The maximum thickness of ice that can raft without breaking depends on the square of the ice thickness. The calculation of 17 cm for typical young sea ice agrees well with field observations, although older ice, because of its greater strength, can raft when it is several meters thick. (Knapp-USGS)
W74-05162

A MECHANICAL MODEL OF RAFTING,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
R. R. Parmerter.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 97-115, January 1974. 6 fig, 8 ref, append. NSF Grant GV-28807.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Rafting(Sea ice).

The simple rafting of two ice sheets of equal thickness is investigated. The force required to initiate rafting is small compared to the force required to buckle the ice sheet. Maximum stresses occur in the submerged portion of the overridden sheet. As the thickness of the sheets is increased, the maximum stress developed during rafting increases. Thus, there exists a critical ice thickness at which rafting causes the overridden sheet to fail. Ice thicker than this critical value will fail and therefore cannot raft. The ice blocks that are broken from the sheet during failture of rafting provide rubble, which then produces a ridge structure. Thus, thick ice tends to deform through ridging and thin ice tends to raft. (Knapp-USGS)
W74-05163

ON THE CALCULATION OF THE ROUGHNESS PARAMETER OF SEA ICE,
Washington Univ., Seattle. Div. of Marine Resources.
C-H. Ling, and N. Untersteiner.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 117-125, January 1974. 4 fig, 1 tab, 14 ref. NSF Grant GV-28807, NSF Grant C-625.

Descriptors: *Sea ice, *Air-water interfaces, *Roughness coefficient, Boundary processes, Winds, Movement, Friction, Turbulent flow, Topography.
Identifiers: *Roughness(Mechanical), Ice dynamics.

A method is described for calculating the roughness parameter of sea ice from velocity profiles. Instead of the conventional procedure of determining an individual roughness for each velocity profile, this method uses a number of profiles to find a single value. By means of a set of data obtained in the Arctic, it is shown that the method greatly reduces the scatter in roughness and produces consistent values for the friction velocity. (Knapp-USGS)
W74-05164

CLASSIFICATION AND VARIATION OF SEA ICE RIDGING IN THE ARCTIC BASIN,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III, S. J. Mock, and W. B. Tucker, III.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 127-146, January 1974. 5 fig, 6 tab, 16 ref, append.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties, *Arctic.
Identifiers: *Ridging(Sea ice).

A one-parameter model for pressure ridges agrees well with more than 3000 km of laser profile data taken from November 1970 to February 1973 in the Arctic basin. Ridging intensity may be determined for a region from the mean number of ridges per unit length and the mean ridge height. Using ridging intensity the number of ridges per kilometer at any ridge height level may be predicted. Although magnitudes of ridging intensity vary in time, the relative regional variations are similar. Consequently, three distinct regions of ridging intensity having relatively stable boundaries can be defined. Annual variation in new ice production due to ridging is sufficiently large to suggest that ridging plays an important role in the overall mass balance of the Arctic basin. (Knapp-USGS)
W74-05165

SIMILARITY CONSTANTS IN THE STRATIFIED PLANETARY BOUNDARY LAYER,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 2E.
W74-05166

AN INVESTIGATION OF CORE DRILLING IN PERENNIALLY FROZEN GRAVELS AND ROCK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
G. R. Lange.
Technical Report 245, December 1973. 26 p, 5 fig, 2 tab, 8 ref, 2 append.

Descriptors: *Core drilling, *Permafrost, *Frozen ground, Boreholes, Cores, Drilling fluids, Drilling, Rotary drilling, Sampling, Drilling equipment, Drilling samples.

The problems of obtaining frozen samples by core drilling of perennially frozen gravel and rock were investigated. Most of the core drilling was carried out in ice-bonded, well-graded alluvial gravel with the ground temperature near its freezing point. Both chilled compressed air and oil-based liquids were used as drilling fluids. The details of both successful and unsuccessful coring attempts are reported. Drilling variables such as weight on the bit, rotational velocity, rate of penetration, fluid temperatures, viscosities, flow rates and pressures and mechanical details of the diamond bits are reported. To make the information more widely applicable, calculated values for the pressure on the bit, the lineal velocity range of the diamond points, the force per diamond point, and the uphole velocity of the fluid stream are given. Some core drilling was also successfully accomplished in frozen, fractured rock. With careful control of the drilling variables, good samples of these difficult materials can be obtained at satisfactory drilling rates so long as the material is well bonded by ice. Suggestions are given for improvement of equipment and methods. (Knapp-USGS)
W74-05170

2D. Evaporation and Transpiration

PAN AND LAKE EVAPORATION IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. J. Rahn.
Available from NTIS, Springfield, Va. 22151, COM-73-11435, Price $3.50 printed copy; $1.45 microfiche. Information Report No 69, May 1973. 23 p, 6 fig, 3 tab, 10 ref.

Descriptors: *Evaporation, *Pennsylvania, *Data collections, Hydrologic cycle, *Evaporation pans, Evaporimeters, Reservoir evaporation, Lakes.
Identifiers: Lake evaporation.

All available sources of pan evaporation data in Pennsylvania are compiled to provide an updated and more detailed analysis than was possible with national maps. Class A pan evaporation is com-

pared to evaporation from lakes and other water podies. Mean annual pan evaporation ranges from about 48 inches in the lower Susquehanna River region to slightly less than 32 inches in the north-central section of the State. Mean annual lake evaporation follows the same general pattern, from about 36 to less than 24 inches. Mean monthly and seasonal values, 90% probability limits, and observed extremes are summarized for six stations with long-term records. Highest mean monthly pan evaporation occurs in July, ranging from about 5.5 to 7.5 inches. Daily extremes in evaporation losses from pans are estimated to range between zero and 0.6 inch. (Knapp-USGS)
W74-05121

COMPARISON BETWEEN PAN AND LAKE EVAPORATION,
C. E. Hounam.
World Meteorological Organization Technical Note No 126, 1973. 52 p, 7 fig, 12 tab, 27 ref.

Descriptors: Evaporation, *Evaporimeters, Calibrations, *Evaporation pans, Reservoir evaporation, Lakes.
Identifiers: *Lake evaporation.

The simplest and most common means of estimating lake evaporation is on the basis of data obtained from pan and tank evaporimeters. The most important types of evaporimeter that are in use are described, with details of their construction and advice on their use. The factors having an influence on pan and lake evaporation are discussed in relation to the various coefficients that have been developed for converting the evaporation rates from pans and tanks to estimates of lake evaporation. These coefficients vary significantly in space, in time, and in relation to the particular characteristics of the lake in question. A description is given of the methods proposed for correcting them so as to eliminate the effects of such variations. (Knapp-USGS)
W74-05155

TRANSPIRATION MEASUREMENT IN PINES USING TRITIATED WATER AS A TRACER,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W74-05197

TRANSPIRATION OF THE MAIN TREE SPECIES ON THE BOL'-SHOI USHKANII ISLAND (THE BAIKAL LAKE) IN DIFFERENT SEASONS (IN RUSSIAN),
V. N. Pautova.
Lesovedenie. 6. p 59-62, 1970, English summary.
Identifiers: Islands, Lakes, Pines, Seasons, Transpiration, *Tree species, *USSR(Lake Baikal).

The characteristics and the order of variation of the transpiration intensity of some tree species are established in their transition from the state of dormancy to that of growth and in the course of the latter. The maximum possible water expenditure by pine needles for 5 winter months in the islands of the Bol'shoi Ushkanii Island is 0.15-0.30 mm. The connection is shown between the transpiration and the age of the plant, shoot, and needles as well as its connection with the tree species.--Copyright 1973, Biological Abstracts, Inc.
W74-05364

2E. Streamflow and Runoff

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

LONGSHORE CURRENTS GENERATED BY OBLIQUELY INCIDENT SEA WAVES,
Oregon State Univ., Corvallis.
M. S. Longuet-Higgins.
Journal of Geophysical Research, Vol 75, No 33, p 6778-6789, November 20, 1970. 4 fig, 5 tab, 32 ref.

Descriptors: *Waves(Water), *Mixing, *Turbulence, Coasts, Beaches.
Identifiers: *Longshore current, Radiation stress, *Wave energy, *Bottom friction, *Surf zone, Nearshore processes.

There exists a simple and precise relationship between the total longshore thrust exerted by the incoming waves on the one hand and their direction and amplitude in deep water on the other. This can be derived either from the concept of the radiation stress, or by a direct evaluation of the momentum flux due to the waves. The local longshore stress due to the waves is very simply related to the local rate of dissipation of wave energy, regardless of whether the dissipation is due to wave breaking or to bottom friction. Hence, using the known relation of breaker height to local depth in the surf zone, one can estimate accurately the local longshore stress due to the waves. When the local longshore wave stress is known, it is possible to write an equation of motion for the longshore current that involves in general both the bottom friction and the horizontal mixing by turbulent eddies. If the horizontal mixing is negligible, the momentum balance gives an exceedingly simple expression for the longshore current. The addition of horizontal mixing generally reduces the current, although not drastically. (Sinha-OEIS)
W74-04943

THE INTERNAL VELOCITY FIELD IN BREAKING WAVES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 2J.
W74-04960

WAVE ENERGY AND LITTORAL TRANSPORT,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
For primary bibliographic entry see Field 2J.
W74-04965

QUANTITATIVE RESEARCH ON LITTORAL DRIFT IN FIELD AND LABORATORY,
Florida Univ., Gainesville. Coastal Engineering Lab.
For primary bibliographic entry see Field 2J.
W74-04966

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04993

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
E. E. Schroeder.
Open-file report, 1973. 297 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Data collections, *Flood data, *Texas, Small watersheds, *Hydrologic data, Flood forecasting, Peak discharge.

Basic hydrologic data are compiled to be used to define the magnitude and frequency of floods for drainage areas of less than 20 square miles in Texas. To accomplish the objective, a network of 150 crest-stage partial-record gages was established. These gages are distributed throughout the State to sample all hydrologic areas and flood-frequency regions as defined by Patterson (1963) and to obtain a representative sample of physical characteristics. Information for unusual peak discharges at ungaged sites is obtained as the opportunity arises. Each gage site is equipped with one or more crest-stage gages and a stage-rainfall recorder. A typical installation consists of two crest-stage gages--one headwater gage and one tailwater gage. Data are being collected at 82 other small-stream stations for other projects, making a total of 232 stations available for this study. During the 1971 water year, annual runoff was deficient in the north, east, and central parts of the State, below average in the west, and average in the south. Runoff at individual sites varied greatly. Several streamflow stations in the southern Edwards Plateau area recorded new peak discharges for the period of record. This occurred during the period Aug. 11-14. No widespread major flooding occurred during the year. Numerous flash floods covering relatively small areas did occur. Tropical disturbances caused heavy rainfall in some coastal areas. (Knapp-USGS)
W74-05107

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 8B.
W74-05128

LARGE RIVERS OF THE UNITED STATES.,
Geological Survey, Reston, Va.
K. T. Iseri, and W. B. Langbein.
Circular 686, 1974. 10 p, 4 fig, 2 tab.

Descriptors: *Rivers, *United States, Distance, *Streamflow, Hydrologic data, Data collections, *Discharge(Water).
Identifiers: *Large rivers(U.S.).

Information on the flow of the 28 largest rivers in the United States is presented for the base periods 1931-60 and 1941-70. Drainage area, stream length, source, and mouth are included. Average discharge is listed at downstream gaging stations. Large rivers are listed in order of average discharge at the mouth, based on the period 1941-70. (Knapp-USGS)
W74-05138

ON THE POSITION OF TIDAL BARRIERS IN NORTHUMBERLAND STRAIT,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
K. B. Yuen.
Manuscript Report Series, No 33, 1973. 26 p, 11 fig, 6 ref.

Descriptors: *Numerical analysis, *Tides, *Water level fluctuations, Mathematical models, Inlets(Waterways), Water levels, Currents(Water), Seiches, *Canada.
Identifiers: *Causeways.

A one-dimensional mathematical tidal model was constructed which reproduces satisfactorily the normal M2, S2, K1, and O1 tidal constituents in Northumberland Strait, Canada. Calculations for the construction of complete tidal barriers at a range of locations indicated that the vicinity of the Cape Tormentine area is very critical for the semidiurnal constituents, especially for the resulting tide on the eastern side of a causeway. The worst case resulted in an M2 head difference of order 9.0 feet from one side of the causeway to the other, yet a shift of less than 12.0 miles could reduce this to only 5.0 feet. In contrast, the diurnal constituents were relatively insensitive to the exact causeway location. For the Cape Tormentine area, the M2 configuration was also examined for the case of partial barriers. Even for 90% closure, the head difference across the causeway was only 1.0 foot. However, the currents increased with greater closure, but even for 80% closure, the M2 current was only 6.0 feet/sec. (Knapp-USGS)
W74-05140

FORECASTING MAXIMUM FLOOD LEVELS ON THE DNIESTER RIVER (PROGNOZ MAKSIMAL'NYKH PAVODOCHNYKH UROVENY VODY R. DNESTRA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-05145

COMPOSITIONAL MODELING OF HYDROGRAPHS (KOMPOZITSIONNOYE MODELIROVANIYE GIDROGRAFOV),
For primary bibliographic entry see Field 2A.
W74-05146

SEASONAL VARIABILITY OF WATER TEMPERATURE IN THE VICINITY OF THE JAPAN CURRENT (VNUTRISEZONNAYA IZMENCHIVOST' TEMPERATURY VODY V RAYONE KUROSIO),
Leningrad State Univ. (USSR).
P. K. Guber, and V. V. Klepikov.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 104-111, March 1973. 2 fig, 2 tab, 12 ref.

Descriptors: *Oceanography, *Water temperature, *Varibility, *Fluctuations, *Seasonal, Thermocline, Heat, Heat balance, Advection, Wind velocity, Currents(Water), Internal waves, Statistical methods, Correlation analysis, Spectroscopy, Curves, Equations, *Pacific Ocean.
Identifiers: USSR, *Japan current(Kuroshio), Ocean weather stations.

Variations in oceanographic conditions were investigated in the region of ocean weather stations 'Extra' ('X') and 'Tango' ('T') in the North Pacific Ocean between July 1951 and November 1953. Intensity and frequency of seasonal fluctuations with time scales ranging from 2-3 days to 3-4 months were determined in the 0- to 1,000-m layer by statistical analysis of water temperature. Seasonal fluctuations of water temperature in the region depend little on fluctuations in the heat balance of the sea surface but are caused mainly by fluctuations in the advection of heat by currents and internal waves. (Josefson-USGS)
W74-05150

THE AIDJEX LEAD EXPERIMENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W74-05158

SUBSURFACE EDDIES IN THE ARCTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2C.
W74-05159

SIMILARITY CONSTANTS IN THE STRATIFIED PLANETARY BOUNDARY LAYER,
Washington Univ., Seattle. Div. of Marine Resources.
R. A. Brown.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 147-155, January 1974. 1 fig, 19 ref.

Descriptors: *Air-water interfaces, *Winds, *Currents(Water), *Boundary layers, Boundary processes, Ocean currents, Ice, Sea ice.

The classical solutions for the relationship between geostrophic, Ekman layer, and surface layer flow were developed into a continuous solution for the semi-infinite flow over a surface. This solution leads to a two-layer composite boundary layer solution with matching criteria. The matching process indicates a correspondence between the stress and the geostrophic flow deviation involving two arbitrary parameters. Some values of these similarity constants determined from data for neutral and stratified boundary layers are discussed. (Knapp-USGS)
W74-05166

STORM OF MAY 5-6, 1973, IN THE DENVER METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
G. L. Ducret, Jr., and W. R. Hansen.
Urban Drainage and Flood Control District, Denver, 1973. 40 p, 6 fig, 5 tab, 2 ref, 2 append.

Descriptors: *Floods, *Colorado, Rainfall-runoff relationships, Flood frequency, *Flood data, Hydrologic data, Flood recurrence interval, Peak discharge.
Identifiers: *Denver(Colo).

A light drizzle that began to fall on parts of the Denver metropolitan area late Saturday evening, May 5, 1973, was the forerunner of a general long-duration rainstorm which, by daylight Sunday, had saturated the soils of the area and sent creeks and gullies swelling with runoff. Rainstorm total precipitation ranged from 2.06 to 4.38 inches at U.S. Geological Survey rainfall-runoff stations in the Denver area. By midday on Sunday the small streams had reached their peak discharge; many canal banks, weakened by capacity flows, broke; reservoirs were spilling; and lakes were flooding adjacent areas. Meanwhile, the South Platte River and major tributaries within the storm area were rising toward peak discharges late Sunday night and early Monday morning. The main-stem South Platte River stations from Littleton to Henderson experienced peak discharges ranging in magnitude from that of a 50-year flood to 1.4 times the 50-year flood. (Knapp-USGS)
W74-05171

2F. Groundwater

GEOTHERMAL ENERGY, A NATIONAL PROPOSAL FOR GEOTHERMAL RESOURCES RESEARCH.
Alaska Univ., College.
Available from the National Technical Information Service as PB-216 423; $4.85 in paper copy, $1.45 in microfiche. Final Report of the Geothermal Resources Research Conference, Battelle Seattle Research Center, Seattle, Wash., Sept 18-20, 1972, Alaska University Publication, 1973. 95 p, 4 tab, 123 ref. NSF Project NSF/RA/N-73-003. Grant GI-34313.

Descriptors: *Geothermal studies, *Conferences, Thermal power, Research and development.
Identifiers: *Geothermal energy.

The National Science Foundation, through its RANN Energy Research and Technology Program, supported this geothermal resources research conference under the chairmanship of former Secretary of the Interior Walter J. Hickel. The objective of the conference was to develop an assessment of the state-of-the-art of geothermal science and technology and to recommend a research program to provide the requisite knowledge for establishing the proper role of geothermal resources in providing additional energy to alleviate the Nation's impending shortage. A further objective was to investigate the potential of geothermal water to supplement present national freshwater supplies. The panel topics were: resource exploration, resource assessment, reservoir development and production, utilization technology and economics, environmental effects, and institutional considerations. A research program should include both short range and long range goals. One of the first tasks is to undertake a research program at an adequate level to better define the magnitude of the resource and accelerate its development. Such a program should include: development of binary fluid power-generating systems; development of improved exploration methods; development of desalination methods for geothermal fluids; development of better models of geothermal reservoirs; and development of faster, cheaper methods for deep drilling into hot formations. (Knapp-USGS)
W74-04917

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. J. Molz.
Available from the National Technical Information Service as PB-228 963, $5.50 in paper copy, $1.45 in microfiche. Auburn University, Alabama. Water Resources Research Institute Bulletin 19, 1974. 46 p, 8 fig, 8 tab, 3 append. OWRR A-029-ALA(1).

Descriptors: Groundwater, *Recharge, *Simulation analysis, *Groundwater movement, Hydrologic budget, *Water table, Aquifers, Computer models, Numerical analysis, Model studies, *South America, *Subsurface flow.
Identifiers: *Colombia(So. Amer.).

Several practical models of the subsurface hydrologic system are constructed. These models have as their core the two-dimensional groundwater flow equation with a vertical recharge term and subject to the assumption of horizontal flow. The recharge term is used to represent the hydrologic processes on the surface and in the unsaturated zone as far as their input to the groundwater system is concerned. In this sense, the models can be used to simulate the subsurface hydrology of a watershed--not simply the groundwater system. Various methods are discussed for evaluating the recharge term including a simple water mass balance, a climatological water balance, a more complex water balance and a recharge distribution based on the USDAHL-70 model of watershed hydrology. Application of several of the models to a watershed in Colombia, South America indicates that the models are relatively easy to apply. Solution is obtained using a program developed by Prickett and Lonnquist (1971) which utilizes an alternating direction, line iteration technique. Flow charts, program listings, and example problems are included.
W74-04973

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W74-04975

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-04992

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2K.
W74-05016

FUNDAMENTALS OF KARST SCIENCE VOLUME 2 (OSNOVY KARSTOVEDENIYA TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.

G. A. Maksimovich.
Permskiy Gosudarstvennyy Universitet, Perm, 1969. 530 p.

Descriptors: *Karst, *Karst hydrology, *Bibliographies, Subsurface drainage, Carbonate rocks, Limestones, Caves, Groundwater, Aquifers, Artesian aquifers, Hydrogeology, Areal hydrogeology, Structural geology, Folds(Geologic), Erosion, Springs, Rivers, Lakes, Runoff, Geologic time, Maps.
Identifiers: USSR, *Thermokarst, Karst regions.

Volume 2 of 'Fundamentals of Karst Science' represents an expanded approach to the problems associated with the study of karst. Intended for use by hydrogeologists, geologists, geographers, planners, and other professionals engaged in karst investigations, the book is divided into 3 parts: (1) problems of karst hydrogeology (including general, applied, and regional hydrogeology of karst); (2) rivers and lakes of karst regions; and (3) some special types of karst (chalk karst and hydrothermokarst). An extensive bibliography of Soviet and foreign literature is included. (Josefson-USGS)
W74-05017

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-05118

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 4B.
W74-05119

GROUNDWATER CONDITIONS OF THE TARAI REGION,
Pant Coll. of Tech., Pantnagar (India).
For primary bibliographic entry see Field 4B.
W74-05131

PRELIMINARY STUDIES ON THE MECHANISMS CONTROLLING THE SALINITY IN NORTHWESTERN ARID REGION OF INDIA--A DISCUSSION ON THE CAUSES OF SALINITY IN THE GROUNDWATER REGIME,
Central Groundwater Board, Faridabad (India).
V. Ramesam, and S. K. Barua.
Indian Geohydrology, Vol 9, No 1, p 10-18, June 1973. 2 fig, 12 ref.

Descriptors: *Saline water, *Saline water systems, *Surface-groundwater relationships, Brines, Evaporation, Salinity, Water chemistry, Arid lands, Salts, Evapotranspiration.
Identifiers: *India.

The salinity of surface water bodies cannot be understood independent of the salinity of underlying groundwater. Based on the chemical analytical results of more than 700 groundwater samples from the water table zone of the districts of Kutch, Gujarat, and Jaisalmer, in Rajasthan, India, an attempt was made to understand the mechanism controlling the groundwater chemistry in the arid region of northwestern India. The cation and anion relations with respect to total dissolved solids indicate evapotranspiration and consequent fractional separation of salts as the dominant process rather than proximity to the sea and transportation of saline matter from the sea. (Knapp-USGS)
W74-05132

SPACING OF HARD ROCK SHALLOW WELLS,
Osmania Univ., Warangal (India). Regional Engineering Coll.
For primary bibliographic entry see Field 4B.
W74-05133

PREDICTIVE SIMULATION OF THE SUBSIDENCE OF VENICE,
Centro di Ricerca IBM di Venezia (Italy).
G. Gambolati, P. Gatto, and R. A. Freeze.
Science, Vol 183, No 4127, p 849-851, March 1, 1974. 2 fig, 6 ref.

Descriptors: *Subsidence, *Land subsidence, *Withdrawal, *Artesian aquifers, Compaction, Floods, Seiches, Mathematical models.
Identifiers: *Italy(Venice).

Land subsidence at Venice (Italy) is the result of sediment compaction in the unconsolidated aquifer system that underlies the Venetian Lagoon. Compaction is caused by extensive groundwater withdrawals at the nearby industrial port of Marghera. The total subsidence at Venice for the period from 1930 through 1973 has been about 15 cm. Predictive simulations with a calibrated mathematical model were hampered by the sparseness of available data, but they suggest that if withdrawals are kept constant in the future as they have been since 1969, about 3 cm of further subsidence can be expected. (Knapp-USGS)
W74-05137

GEOTHERMAL RESOURCE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: SPECIAL REPORT TEST WELL MESA 6-1.
Bureau of Reclamation, Denver, Colo. Lower Colorado Region.
For primary bibliographic entry see Field 4B.
W74-05139

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE),
Leningrad State Univ. (USSR).
G. F. Larionov.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 59-62, March 1973. 17 ref.

Descriptors: *Geochemistry, *Trace elements, *Groundwater, *Dissolved solids, *Salts, Ions, Ion transport.
Identifiers: *USSR(Kazakhstan), Mineralization.

Most investigators contend that the content of trace elements in waters of varied dissolved-solids content is controlled mainly by the product of solubility and stability of their natural compounds, coprecipitation of microadmixtures with relatively insoluble compounds, and the sorption capacity of rocks. Judging from results of experiments and on-site investigations, these factors are significant only when trace element contents considerably exceed their actual concentrations in natural waters and when there is a sudden change in the conditions of the environment. In all probability, the cause of the relation between salt content in solution and trace element concentration should be sought in the internal structure of molecular processes occurring in groundwater. The concentration of negatively hydrated ions, which include most anions and some cations, increases with increasing dissolved-solids content of natural waters. Between positively hydrated ions (which include almost all cations) and dissolved-solids content of the waters, this relation apparently does not exist. (Josefson-USGS)
W74-05147

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
For primary bibliographic entry see Field 4B.
W74-05168

GROUNDWATER IN THE NORTHERN WISO BASIN AND ENVIRONS, NORTHERN TERRITORY,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
For primary bibliographic entry see Field 4B.
W74-05331

NUMERICAL AND ANALYTICAL SOLUTIONS OF DISPERSION IN A FINITE, ADSORBING POROUS MEDIUM,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-05334

EXTENSIVE PUMPING FROM UNCONFINED AQUIFERS,
Birmingham Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-05336

RETENTION BASIN FAILURES IN CARBONATE TERRANES,
Geological Survey of Albama, University. Limestone Hydrology Section.
For primary bibliographic entry see Field 5B.
W74-05337

2G. Water In Soils

DEGRADATION OF PARATHION BY BACTERIA ISOLATED FROM FLOODED SOIL,
Central Rice Research Inst., Cuttack (India). Dept. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W74-04889

ESTIMATING THE DENSITY OF INDIVIDUAL BACTERIAL POPULATIONS INTRODUCED INTO NATURAL ECOSYSTEMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5A.
W74-04890

DETERMINATION OF THE ABSORPTION CAPACITY IN SOILS, (IN RUSSIAN),
N. B. Myakina.
Biol Nauki. Vol 15, No 8, p 136-138. 1972.
Identifiers: *Absorption capacity(Soils), *Soil analysis, *Carbonate soils.

The acetate method for determining the absorption capacity in carbonate soils is as accurate as the standard method and requires less time for mass analyses.--Copyright 1973, Biological Abstracts, Inc.
W74-04947

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-04981

COMPARATIVE CHARACTERISTICS OF DESERT SOILS OF USSR AND AUSTRALIA, (IN RUSSIAN),
L. A. Dorokhov.
Probl Osvoeniya Pustyn', 2p 18-31. 1972, (English summary).
Identifiers: *Australia, Claypans, Climates, *Desert soils, Magnesium, Proluvial soils, Salts, *USSR, *Soil comparisons.

In Australia's arid zone, soil evolutionary history differs from that in desert of USSR. Australian soils are developed from lateritic material formed during intensive weathering in a humid period. The paleosubtropical as well as paleotropical conditions have almost no effect on recent soils in arid lands of USSR. The stony tableland soils (solonetz soils) of Australian arid zone have large amounts of Mg, and thus they may be expected to be similar to vertisols, rather than to Middle Asia grey-brown soils. Sandplain and sandridges of Australia are of proluvial origin, whereas the sand expanses in arid parts of USSR are reworked by powerful river courses. The genesis and morphological characteristics as well as salt profile of claypans strongly resemble those of takyrs. Both types of soils are widespread. The modern soils evolutionary processes show evidence of carbonate and sulfate accumulation which seems to be universal.--Copyright 1973, Biological Abstracts, Inc.
W74-04998

EXPERIMENT IN RAPID LEACHING OF SALINE SOILS IN THE GOLODNAYA STEPPE (OPYT USKORENNOY PROMYVKI ZASOLENNYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 3C.
W74-05018

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF FROZEN SOIL AND ON EROSION PROCESSES (VLIYANIYE LUNKOVANIYA ZYABI NA VODNO-FIZICHESKIYE SVOYSTVA MERZLOY POCHVY I PROTSESSY EROZII),
I. A. Pabat.
Pochvovedeniye, No 12, p 105-113, 1972. 1 fig, 6 tab, 18 ref.

Descriptors: *Land management, *Fallowing, *Erosion control, *Frozen soils, *Soil physical properties, Bulk density, Compaction, Permeability, Infiltration, Infiltration rates, Soil moisture, Moisture content, Melt water, Snowmelt, Runoff, Slopes, Ice, Freezing.
Identifiers: *USSR(Ukraine), *Dibbling.

Field investigations were made of water and air permeability of frozen soil, melt-water runoff, and soil erosion as a function of soil moisture content, snow accumulation, depth of soil freezing, and fallow cultivation practices on slopes in the central steppe of the Ukraine. Dibbling on slopes was found to reduce to some extent the moisture content and compaction of the upper 10-cm layer of soil between the holes and the depth of freezing under them. This increased the water and air permeability of frozen soil during spring snowmelt, thereby reducing runoff and soil erosion by a factor of 2-10. Destruction of the upper water-impermeable soil layer and of the ice crust by dibbling prior to spring snowmelt may prove to be a reliable and promising method of water conservation and erosion control. Effectiveness of the LOD-10 dibbler in controlling water and wind erosion of soils is noted. (Josefson-USGS)
W74-05019

WATER-HOLDING CAPACITY OF COARSE AND MEDIUM LOESSLIKE LOAMS (O VODOUDERZHIVAYUSHCHEY SPOSOBNOSTI LEGKIKH I SREDNIKH LESSOVIDNYKH SUGLINKOV),
L. G. Balayev.
Pochvovedeniye, No 12, p 92-98, 1972. 2 fig, 9 ref.

Descriptors: *Soil physics, *Soil moisture, *Retention, *Loam, *Loess, Soil water movement, Capillary action, Field capacity, Wetting, Pore water, Equilibrium.
Identifiers: *USSR(Tadzhikistan-northern Causasus).

Moisture content in the zone of aeration of loess was determined in the Vaksh Valley of Tadzhikistan and in the Northern Caucasus. Pore water of loam and clay soils in the moisture range from minimum moisture capacity to interrupted capillary moisture is capable of moving by gravity in the liquid droplet state. Complete moisture equilibrium occurs in the soils at interrupted capillary moisture. A relation was found between mobility of suspended water and moisture content of the underlying soils. Since suspended water of loam and clay soils at minimum moisture capacity is not in a state of equilibrium, the term 'minimum moisture capacity' should be replaced by that of 'field capacity.' (Josefson-USGS)
W74-05020

COMPARATIVE STUDY OF THE PHYSICOCHEMICAL PROPERTIES OF MELIORATED AND NON-MELIORATED SOILS AT THE MUGAN EXPERIMENTAL MELIORATION STATION, (IN RUSSIAN),
I. S. Iskenderov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 1, p 61-65, 1972. Illus.
Identifiers: Alumino-silicates, Filtrability, Hydrophilic, Melioration, *Mineral compounds, *Physicochemical studies, Silicates, *Soils, Swelling, *USSR.

Changes occurred in the hydrophilic properties, filtrability and swelling capacity of the soils in the course of melioration. The mineral component underwent minor changes. Amorphous mineral compounds were more dynamic than the mineral compounds of the aluminosilicate component under melioration and irrigation conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-05037

SOIL RESPIRATION, NITROGEN MINERALIZATION AND HUMUS DECOMPOSITION OF EAST AFRICAN SOILS AFTER DRYING AND REMOISTENING (IN GERMAN),
Forschungsanstalt fuer Landwirtschaft, Braunschweig (West Germany). Institut fuer Bodenbiologie.
G. Jagnow.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 56-66, 1972, English summary.
Identifiers: *Africa, *Humus decomposition, *Mineralization, *Nitrogen, Respiration, *Soils.

Soil respiration and N mineralization of 51 East African cultivated, savanna and forest soils were compared after 3 and 21 wk of air drying. The average soil respiration after 21 wk of drying was 1.221 plus or minus 0.106 times higher than that after 3 wk of drying whereas the average N mineralization was not increased significantly (factor 1.132 plus or minus 0.256). The increase in soil respiration was correlated positively with the water soluble organic matter. During air drying of 3 days and moist incubations of 4 days at 30C, which were repeated 20 times in 10 soils, 3-10% of the organic C and 8-19% of the organic N (low humus vertisol 69%) were mineralized. Changes in the amount and the extinction of humic and fulvic acids were considered to be indicative for an increased humification during the drying and remoistening of soils.--Copyright 1973, Biological Abstracts, Inc.
W74-05054

THE INFLUENCE OF PRECIPITATION AND ALTITUDE ON THE HUMUS CONTENT OF EAST AFRICAN SOILS (IN GERMAN),
Forschungsanstalt fuer Landwirtschaft, Braunschweig (West Germany). Institut fuer Bodenbiologie.
G. Jagnow.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 13-21, 1972, Illus, English summary.
Identifiers: *Africa, Altitude, *Carbon, *Humus, *Nitrogen, Precipitation, *Soils.

Positive correlations were found between the log of the C and N content of the 0-15 cm soil layer, altitude and average annual precipitation of 20 grassland soils, 13 forest soils and 21 cultivated soils at altitudes of 10-2840 m and a precipitation of 380-2410 mm in Kenya, Tanzania and Uganda. For each of the soil groups equations with the 2 variables, altitude and precipitation, were derived, which accounted for 76-93% of the variation of the C (0.42-5.62%) and N (0.04-0.71%) content. There was no correlation between altitude precipitation and the C/N ratio of the soils.--Copyright 1973, Biological Abstracts, Inc.
W74-05058

INFLUENCE OF PARENT MATERIAL AND SLOPE EXPOSURE ON PROPERTIES OF SOILS RELATED TO ERODIBILITY IN NORTH CENTRAL ANATOLIA,
Forstliche Forschungsanstalt, Munich (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 2J.
W74-05066

STUDY OF CONDENSED WATER ACCUMULATION IN SANDY DESERT, (IN RUSSIAN),
T. Khodzhamuradov, and M. Kurbannazarov.
Probl Osvoeniya Pustyn'. 2, p 68-70, 1972. English summary.
Identifiers: *Absorption, Condensed water, Deserts, Sands, *Sandy desert, Temperature, Pressure, *Hydroscopicity, *Moisture.

Under the natural conditions, at variable rates of temperature, humidity and pressure, the value of water absorption by sand from the atmosphere exceeds maximum hygroscopicity. During the night atmospheric moisture is accumulated in surface layers and during the day it moves into deeper layers in which diurnal temperature variations occur.--Copyright 1973, Biological Abstracts, Inc.
W74-05115

EOLIAN ORIGIN OF MICA IN HAWAIIAN SOILS,
Oregon State Univ., Corvallis. School of Oceanography.
J. Dymond, P. E. Biscaye, and R. W. Rex.
Geological Society of America Bulletin, Vol 85, No 1, p 37-40, January 1974. 1 fig, 2 tab, 19 ref.
NSF Grants GA-30794X and GX-28671(CLIMAP).

Descriptors: *Aeolian soils, *Clay minerals, *Hawaii, Radioactive dating, Quartz, Mineralogy, Provenance, Soil formation.
Identifiers: Mica, *Oahu(Hawaii).

Mica- and quartz-bearing soils from the high-rainfall regions of the island of Oahu were analyzed for their K-Ar and Rb-Sr age to test for an eolian versus pedogenic origin of the mica. K-Ar and Rb-Sr apparent ages are approximately 100 times greater than the age of volcanism on the island. In addition Sr-87/Sr-86 values for mica-bearing soils are as high as 0.7273 and contrast greatly with the nonradiogenic strontium in Hawaiian lavas (0.703 to 0.707). These measurements show that the potassium- and strontium-bearing minerals of the Hawaiian soils are not of local origin and confirm the importance of eolian transport of mica and clays to the North Pacific. (Knapp-USGS)
W74-05136

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
L. L. Dvornikova.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 78-86, March 1973. 5 tab, 7 ref.

Descriptors: *Soils, *Soil moisture, *Excess water(Soils), *Trace elements, *Geochemistry, Copper, Cobalt, Nickel, Manganese, Boron, Soil profiles.
Identifiers: *USSR(Leningrad Oblast).

Relation of the behavior of mobile forms of trace elements Cu, Co, Ni, Mn, and B to degree of soil wetting was investigated in soil profiles taken on a plowland in the northern part of the Ordovikskoye Plateau in Leningrad Oblast. Studies were conducted on plowed soils formed on calcareous and leached moraine loam and on meadow and forest soils developed under similar natural conditions. The effect of excess moisture on trace element content and distribution throughout the profile is most pronounced in Sod- and Peat-Gley soils. In excessively wet Sod-Podzolic soils nickel accumulates throughout the entire profile, while copper accumulates in the lower gleyed horizons. Changes in Mn, Co, and B concentrations are poorly expressed. Trace elements in Sod-Calcareous soils generally react weakly to periodic excess wetting. (Josefson-USGS)
W74-05148

CESIUM-137 SOIL INVENTORY OF A TAGGED LIRIODENDRON FOREST 1962 AND 1969,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05193

CALCIUM CYCLING: DIFFUSION INTO A FOREST SOIL,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05200

THE SOILS OF THE URAL RIVER ZONE IN THE GUREV REGION AND THEIR IMPROVEMENTS DURING IRRIGATION, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Pochvovedeniya.
E. G. Dzhakishev.
Izv Akad Nauk Kaz SSR Ser Biol. 4, p 1-7. 1972.
Identifiers: *Irrigation, Rivers, *Soils, *USSR(Gureo region), *Ural river.

The natural and soil-meliorative conditions of the Ural river region (USSR) are studied. The region is divided into 7 categories according to the degree of suitability to irrigation.--Copyright 1973, Biological Abstracts, Inc.
W74-05205

CONTENT AND COMPOSITION OF ORGANIC MATTER IN SOD PODZOLIC AND SOD SANDY SOILS OF DIFFERENT DEGREES OF WETTING, (IN RUSSIAN),
L. V. Drechina.
Vestn Beloruss Univ 2.2. p 77-82, 1970.
Identifiers: Coniferous forests, Forests, Fulvic-acid, Humic-acid, Humification, Meadow, Nitrogen, *Organic matter, Plowland, *Podzolic soil, *Sandy soil, Sod soils, Wetting.

The composition of organic matter in light-textured soils of different degrees of wetting under coniferous forests, meadow and plowland, is described. The process of humification in forest soils proceeds mainly with the production of fulvic acids. With the progressive increase of wetting, the ratio of humic acid to fulvic acid (Ch:Cf) increases regularly in forest and meadow soils. The concentration of N in soils and in individual groups of organic matter was determined.--Copyright 1973, Biological Abstracts, Inc.
W74-05237

THE POSSIBILITY OF SODA FORMATION IN SOIL BY BIOCHEMICAL MEANS, (IN RUSSIAN),
P. A. Kerzum, S. I. Vasil'chikova, R. G. Gorbunova, and A. F. Zakharchenko.
Dokl Akad Nauk Tadzh SSR. Vol 15, No 9, p 54-56. 1972.
Identifiers: Biochemical processes, *Calcium carbonate, Soda formation, *Soil chemistry, *Calcium sulfate.

Under laboratory conditions, an experiment was conducted to establish meadow conditions with sub-surface waters and organic materials. It was possible, through a series of reactions, to decrease the CaCO3 level while the CaSO4 level increased in the separated horizons of oxidated soil zones.--Copyright 1973, Biological Abstracts, Inc.
W74-05271

PROBLEMS OF THE ORGANIC MATTER OF ORGANOGENIC SOILS, (IN RUSSIAN),
S. G. Skoropnaov, and V. S. Brezgunov.
Dokl Akad S-Kh Nauk 12. p 20-22. 1972. Illus.
Identifiers: Crop rotation, Drainage, Grain, Grass, Meadow, *Organic matter, *Organogenic soils, *Peat bogs, Reclamation, *Soils, Water storage.

In the reclamation and the agricultural use of organogenic soils (peat bogs), losses of organic matter and transformations of the quality of the organic matter occur. Under certain conditions both factors are undesirable, since the water-storage capacity of the soils decreases. The soil-forming process occurring under the effect of reclamation must be regulated by an optimal degree of draining and by the character of soil use. This is achieved by using the soils for meadow cultivation lowering the groundwater in conformity with the requirements of meadow grasses. The soils may also be used for grain crops-meadow grass rotation.--Copyright 1973, Biological Abstracts, Inc.
W74-05279

HYDRIC REGIME OF AN ARGIUDOL (IN SPANISH),
Universidad Nacional de Tucuman (Argentina).
R. B. Zuccardi, G. S. Fadda, and M. R. Caceres.
Rev Agron Noroeste Argent, Vol 9, No 2, p 347-365, 1972, Illus, English summary.
Identifiers: *Argiudol, *Hydric regime, *Soil moisture.

With slight variations, the period of soil drying starts in May and ends in Oct. In Nov.-April the soil reconstitutes its hydric reserves. These periods coincide in general with the periods of negative and positive hydric balance calculated after Thornthwaite. Small hydric reserves are registered in Oct. The soil normally reaches its highest hydric content in the 50 cm on top in Feb. Hydric contents lower than the wilting point are registered between Sept. and mid-Nov. Moisture contents are high in the surface horizons in Dec.-March.--Copyright 1973, Biological Abstracts, Inc.
W74-05324

WATER REGIME OF SOD PODZOLIC SOILS UNDER SPRUCE FORESTS OF DIFFERENT AGES, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-05343

INVESTIGATIONS ON THE TRANSFER OF BIOELEMENTS FROM ORGANIC MATTER TO SOIL SOLUTION IN THE HUMUS LAYER OF A BEECH STAND (IN GERMAN),
R. Mayer.
Z Pflanzenernaehr Bodenkd, Vol 131, No 3, p 261-273, 1972, Illus, English summary.
Identifiers: Beech, Bioelements, *Humus layers, Leaf, Organic matter, *Soil solution, *Seepage, *Canopy drip, *Input-output analysis, Lysimeters.

Monthly and annual fluxes of bioelements were measured at 2 levels: at the soil surface (= input) and at the lower boundary of the humus layer (= output) by determination of amount and concentration of the precipitation (canopy drip), of the litter and of the seepage. Seepage was collected with funnel lysimeters. By comparison of both fluxes (input-output-analysis) for some bioelements, mathematical equations could be derived which describe the transfer of these elements from organic matter to soil solution. The results are explained as consequence of the different bonds of the elements in leaf tissues and in humus substances.--Copyright 1973, Biological Abstracts, Inc.
W74-05367

EXPERIENCE OF MEADOW SOIL DESALINATION IN MURGAB OASIS (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W74-05368

WATER PROPERTIES AND WATER REGIME OF SOD PODZOLIC SOILS AND MEANS OF THEIR IMPROVEMENT (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05370

SOIL-WATER-POTENTIALS DEPENDING ON TEMPERATURE, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Bodenkunde.
J. Richter.
Z Pflanzenernaehr Bodenkd. Vol 131, No 3, p 254-261. 1972. Illus. (English summary).
Identifiers: *Hysteresis, *Soil water potentials, *Temperature, Clay, Sand.

The soil-water potential of different soils was measured. At -200,000 and -700,000 erg/cc all soils showed a significant dependence of the soil-water potential on temperature in connection with hysteresis phenomena. With soils rich in clay or sand the dependence was most pronounced. At very high suction values (< -700,000 erg/cc erg cm -3) the dependence became small. The measurements agreed well with psychrometric evaluations of Campbell and Gardner on the no-temperature-dependence of the soil-water potential in the range of about -3,000,000 to 20,000,000 erg/cc.--Copyright 1973, Biological Abstracts, Inc.
W74-05372

MOISTURE AND TEMPERATURE REGIMES IN THE SOUTHERN-TAIGA SOILS OF CENTRAL SIBERIA AND HABITAT CONDITIONS FOR CROPS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05373

EFFECT OF CROPS AND THEIR PREDECESSORS ON THE AGGREGATE COMPOSITION OF MEADOW SIEROZEM SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05374

TOXICITY OF SOD PODZOLIC SOILS LYSIMETRIC SOLUTIONS, (IN RUSSIAN),
G. N. Marshunova.
Byull Vses Nauchno-Issled Inst S-Kh Mikdrobiol. Vol 14, No 3, p 88-92. 1970.
Identifiers: *Fertilizers, Lysimetric solutions, Microorganism, *Sod podzolic soils, Soils, *Toxicity(Yeast), Hydrogen ion concentration.

The toxicity of lysimetric solutions from all horizons of sod podzolic soils was greater in March than in April. Toxicity was expressed in percent destruction of epiphytic yeasts in 24 hr. Insignificant fluctuations in the pH of the soil solutions led to differences in toxicity. The number of microorganisms was higher in April than in March in all horizons. Data are reported on the effect of fertilizers upon the concentration of microorganisms and the toxicity for plants of soil and lysimet-

ric solutions. The toxic substances may be washed out or partially adsorbed in different horizons. The toxicity of aqueous soil extracts is usually weaker than that of lysimetric solutions.--Copyright 1973, Biological Abstracts, Inc.
W74-05375

SOME DATA ON SECONDARY SALINIZATION OF KRASNOZNAMENSKII IRRIGATED MASSIF, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05376

AGROCHEMICAL PROPERTIES AND FORMS OF PHOSPHATES IN TYPICAL SIEROZEMS IRRIGATED AT VARIOUS TIMES, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05377

THE EFFECT OF DIFFERENT TILLAGE METHODS ON THE PHYSICAL PROPERTIES OF SOIL, (IN RUSSIAN),
Grodnenskii Selskokhozyaistvennyi Institut (USSR).
I. S. Mot', and A. M. Karpitskii.
Sb Nauchn Tr Grodnenskii S-Kh Inst. 7. p 108-115. 1970.
Identifiers: Aggregates, Density, *Porosity, *Soil properties, *Tillage, *Sod podzolic soils.

Different tillage methods have different effects on the general porosity of the soil. The lowest bulk density and the largest non-capillary porosity were found in the 10-20-cm layer, whereas in the thoroughly cultivated and the shallow tilled variants they occurred in the 0-10-cm layer. Destruction of soil structure occurs in the fall and winter-spring periods. In the summer partial recovery takes place. Irrespective of the tillage methods the water stability of the aggregates in light-loamy sod podzolic soils is inadequate.--Copyright 1973, Biological Abstracts, Inc.
W74-05378

EFFICACY OF LARGE DOSES OF MINERAL FERTILIZERS IN IRRIGATED SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05379

2H. Lakes

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04859

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
For primary bibliographic entry see Field 5B.
W74-05021

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 2J.
W74-05031

BOTTOM FAUNA OF GOLCUK LAKE. 1. POPULATION STUDY OF CHIRONOMIDS, CHAOBORUS AND OLIGOCHAETA,
Aegean Univ., Bornova (Turkey).
For primary bibliographic entry see Field 5C.
W74-05044

PRODUCTION OF A NATURAL POPULATION OF BITHYNIA TENTACULATA L. (GASTROPODA, MOLLUSCA),
Syracuse Univ., N.Y. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-05049

SPATIAL DIFFERENTIATION AND CHANGES IN TIME OF ZOOMICROBENTHOS IN THREE MASURIAN LAKES,
Warsaw Univ. (Poland). Zoological Inst.
For primary bibliographic entry see Field 5C.
W74-05050

SPATIAL DIFFERENTIATION ABUNDANCE OF BACTERIA IN THE WATER OF MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W74-05051

LIMNOLOGICAL SURVEY OF LAKES MICHIGAN, SUPERIOR, HURON AND ERIE,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W74-05067

HYDROBIOLOGICAL STUDIES 2.
Ceskoslovenska Akademie Ved, Prague.
For primary bibliographic entry see Field 5C.
W74-05068

EFFECT OF AN UPSTREAM RESERVOIR ON THE STRATIFICATION CONDITIONS IN SLAPY RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05069

CHANGES OF SOME CHEMICAL CONSTITUENTS AND BACTERIAL NUMBERS IN SLAPY RESERVOIR DURING EIGHT YEARS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05070

THE CHANGES IN SEVERAL PARAMETERS OF PLANKTON PRIMARY PRODUCTIVITY IN SLAPY RESERVOIR 1960-1967, THEIR MUTUAL CORRELATIONS AND CORRELATIONS WITH THE MAIN ECOLOGICAL FACTORS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05071

THE CHANGES OF BENTHOS IN SLAPY RESERVOIR IN THE YEARS 1960-1961,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05072

LIMNOLOGY OF TWO RE-REGULATION RESERVOIRS IN CZECHOSLOVAKIA,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05073

THE INFLUENCE OF TWO RE-REGULATION RESERVOIRS ON THE CHEMICAL AND BACTERIOLOGICAL PROPERTIES OF RIVER WATER,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05074

PAN AND LAKE EVAPORATION IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2D.
W74-05121

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5C.
W74-05201

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-05204

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 5C.
W74-05208

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W74-05210

HILOMETRA NODULOSA IN WYOMING
VHITE SUCKERS,
Vyoming Game and Fish Commission, Casper.
or primary bibliographic entry see Field 5C.
/74-05329

IONOMICS OF CYCLOPS STRENUUS ABYS-
ORM SARS (COPEPODA:CYCLOPOIDA),
reshwater Biological Association, Ambleside
England).
or primary bibliographic entry see Field 5C.
/74-05344

I. Water In Plants

EDESCRIPTION OF MAPPATES PLATAXUS
ANGNEKAR (COPEPODA: CALIGIDAE),
erala Univ., Trivandrum (India). Dept. of
quatic Biology and Fisheries.
. S. Hameed, and N. K. Pillai.
ydrobiologia, Vol 42, No 4, p 403-411, Sep-
mber 28, 1973. 18 fig, 15 ref.

escriptors: *Copepods, *Systematics.
dentifiers: *Mappates platexus, Anurites, Pseu-
anuretes, Heniocophilus, Eirgos, Animal
orphology.

detailed description of Mappates plataxus is
resented. In the light of the present study it is
ggested that the closely allied genera Auretes,
seudanuretes, Heniochophilus, Mappates, and
irgos do not show any valid generic difference.
he suggestion that they may be considered as
ubgenera under the genus Anuretes is put forth.
Mortland-Battelle)
/74-04877

HE CHARACEAE OF SOUTHEASTERN
NITED STATES,
hode Island Univ., Kingston. Dept. of Botany.
or primary bibliographic entry see Field 5A.
/74-04879

AXONOMY, DISTRIBUTION AND ECOLOGY
F THE GENUS SESARMA (CRUSTACEA,
ECAPODA, GRAPSIDAE) IN EASTERN
ORTH AMERICA, WITH SPECIAL
EFERENCE TO FLORIDA,
mithsonian Tropical Research Inst., Balboa,
anal Zone.
. G. Abele.
he American Midland Naturalist, Vol 90, No 2, p
75-386, October 1973. 1 fig, 2 tab, 12 ref.

escriptors: *Systematics, Ecology, *Ecological
istribution, Habitats, Crustaceans, Speciation,
patial distribution, *Crabs, Invertebrates,
Florida, North America, Marine animals.
dentifiers: *Shore crabs, *Sesarma, Animal
orphology, Macroinvertebrates, Driftline crab,
esarma (Holometopus) cinereum, Sesarma
Holometopus) ricordi, Sesarma (Holometopus)
enedicti, Sesarma (Holometopus) miersii, Sesar-
a (Sesarma) reticulatum, Sesarma (Sesarma) cu-
acaoense, Decapods.

ix species of the grapsid crab genus Sesarma are
eported from eatern North America. A key for
heir identification is presented and their diag-
ostic characters are illustrated. Their distribu-
ions in the western Atlantic are reviewed and a
nap is given of their distributions in Florida, an
rea where all six species occur. Field observa-
ions on the biology and ecology of four species
re presented. Character divergence occurs
etween two closely related, partially sympatric
pecies. Several factors are suggested to account
or the observed patterns of distribution.
(Holoman-Battelle)
W74-04880

PHYTOMASS RESERVES IN SOME TYPES OF TUNDRA FROM THE NORTHERN OB RIVER RELATED AREA, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
G. V. Trotsenko.
Ekologiya. Vol 3, No 5, p 90-93. 1972.
Identifiers: Phenology, *Phytomass reserves(Trees), Rivers, *Tundra, *USSR(Ob River), *Tree types(Root systems).

Phytomass reserves were determined in tree types of tundra near the Ob river (USSR). Aboveground and root systems were measured and the phytomass determined. The beginning of August was the peak of agreement with data of phenological studies. There was less reserve in the shoot than in the root system.--Copyright 1973, Biological Abstracts, Inc.
W74-04940

ALTITUDINAL VARIATION OF CHLOROPHYLL CONCENTRATION AND REFLECTANCE OF THE BARK OF POPULUS TREMULOIDES,
New Mexico Univ., Albuquerque. Dept. of Biology.
W. W. Covington.
Available from the National Technical Information Service as PB-228 873, $4.75 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 32 p, 4 fig, 3 tab, 22 ref. OWRR A-039-NMEX(1).

Descriptors: *Photosynthesis, *Bark, *New Mexico, *Reflection, Deciduous trees, Forests, Elevation, Altitude, Ecosystems, *Chlorophyll, Trees, Plant tissues, Plant pigments, Deciduous forests, Mountain forests, Plant physiology, *Cottonwoods.
Identifiers: Quaking aspen, *Populus tremuloides, Corticular photosynthesis, Corticular chlorophyll.

Chlorophyll concentration and reflectance of bark samples of Populus tremuloides Michx. growing at various elevations in the Sangre de Cristo mountain range of New Mexico indicate that the appearance of greener barked trees at higher elevations is due to the reflectance characteristics of a bloom of dead periderm cells and not to increased chlorophyll concentrations. Chlorophyll concentrations in aspen bark were, in fact, inversely correlated with altitude. The higher concentration of chlorophyll at lower elevations is effectively masked by a white bloom which is also characteristic of exposed site trees. At higher elevations the bloom is yellow-brown and more translucent thus allowing the chlorophyll layers beneath to show through. Therefore, trees at higher elevations appear greener even though they have lower corticular chlorophyll concentrations. The ecological significance of altitudinal variations in chlorophyll concentrations and reflectance of aspen bark is discussed. (Creel-New Mexico)
W74-04977

THE RELATIONSHIP OF SOIL TEMPERATURE AND CYTOKININ PRODUCTION IN ASPEN INVASION,
New Mexico Univ., Albuquerque. Dept. of Biology.
K. R. Williams.
Available from the National Technical Information Service as PB-228 870, $5.25 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 39 p, 5 fig, 2 tab, 33 ref. OWRR A-039-NMEX(2).

Descriptors: *New Mexico, *Soil temperature, *Reproduction, *Invasion, Soil analysis, Temperature, Root development, Deciduous trees, Forests, Trees, Deciduous forests, Mountain forests, Soil moisture, Soil-water-plant relationships, Vegetation regrowth, *Cottonwoods, Regression analysis.
Identifiers: *Cytokinin, *Aspen invasion, Populus tremuloides, Quaking Aspen, Thermal regulation, Sprouting.

Quaking aspen (Populus tremuloides Michx.) primarily reproduce by suckering (i.e., root sprouting). Numerous environmental variables have been suggested as causes of this phenomenon, the most notable of which is soil temperature. Studies demonstrating thermal regulation of sprouting indicate the involvement of growth hormones. The only class of hormones to elicit a response similar to sprouting is the cytokinins. Other hormones, no doubt, function in this process as well (e.g., auxins). To substantiate the idea that thermal regulation of sprouting is primarily a function of thermal regulation of cytokinin activity, and to determine the importance of other environmental factors in this scheme, various measurements of field conditions and several laboratory experiments were employed. Regression analyses results indicated that in this subalpine meadow, 91.9% of the variation in soil moisture was accounted for by the silt percentage, and 66% of the variation in soil temperatures was accounted for by soil moisture. Significant relationships exist between numbers of sprouts invading the meadow and soil temperature at each position. Laboratory experiments showed that there exist 'cause-effect' type relationships between soil temperature, cytokinin levels, and sprout production of root sections, and when no factor is severely limiting, sprouting and generally aspen invasion is primarily a thermally controlled process. Thermal control is accomplished through alteration of cytokinin activity levels. (Creel-New Mexico)
W74-04978

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04979

RECENT MEASUREMENTS OF CESIUM-137 IN RESIDENCE TIME IN ALASKAN VEGETATION,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05188

ACCUMULATION OF CE-144 BY HICKORY AND CO-60 BY BLACK GUM SEEDLINGS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05196

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
For primary bibliographic entry see Field 4A.
W74-05214

EFFECT OF TRACE ELEMENTS ON THE WATER REGIMEN, THE DECORATIVE QUALITIES AND THE SEED YIELD OF SOME ORNAMENTAL PLANTS, (IN RUSSIAN),
Kishinev Botanical Garden (USSR).
For primary bibliographic entry see Field 5C.
W74-05345

INFLUENCE OF SOIL WATER LOGGING DURING SPRING, FOLLOWED BY SUMMER DRYNESS, ON THE BEHAVIOR OF YOUNG PLANTS OF NORWAY SPRUCE, (IN FRENCH),
G. Levy.
Ann Sci For. Vol 28, No 4, p 403-423. 1971. (English summary).
Identifiers: Dryness, Growth, Height, Mortality, Nutrition, Plants, Rooting, *Soil water, Spring, *Spruce(Norway), Summer, Waterlogging.

A greenhouse experiment was conducted using large pots filled with pseudogley soil (A1 and A2)

horizons. There were 4 spring treatments (soil at field capacity, level of water table 7, 14 or 21 cm below the soil surface) and 3 summer treatments (soil at field capacity, watered once a month, watered twice a month) giving a combination of 12 treatments. Data were recorded on highest growth, rooting, mortality and nutrition. A shallow water table in spring followed by severe summer drought was the most unfavorable. All waterlogged roots dried but regrowth took place in summer.--Copyright 1973, Biological Abstracts, Inc.
W74-05348

MICROCLIMATIC CONDITIONS ON THE CUTOVER AREAS OF SHELTERWOOD CUTTINGS, (IN RUSSIAN),
V. E. M. Maksimov.
Nauchn Tr Leningr Lesotekh Akad. 127, p 31-34. 1970.
Identifiers: *Climatic conditions, Cut-over areas, *Cuttings, Humidity, Light, Shelterwood, *Spruce, Temperature.

Indexes of the annual increment of spruce advance growth in 1957-1966 are presented after the initial and the final stages of shelterwood cuttings. The influence of varying conditions of light, temperature and humidity of air and of soil is considered.--Copyright 1973, Biological Abstracts, Inc.
W74-05349

THE PROBLEM OF THE MICROCLIMATE OF THE DRY PINE FOREST, (IN RUSSIAN),
B. M. Kavalyauskas, and I. S. Tomkus.
Liet Tse Modsiu Akad Darb Ser B. 2, p 237-244. 1970. (English summary.).
Identifiers: Air humidity, *Climates, Dry forest, *Pine forests, Radiation, Temperature, Velocity, Winds, *USSR(Lithuania).

Results of the actinometric and gradient meteorological observations in 1968 in a dry pine forest and on an open field in southern Lithuania, USSR, are presented. Only 41% of the total incoming solar radiation reached the forest floor under the pine canopy. The ratio of diffused radiation to the total radiation was 39% in the field, and 50% under the canopy. The average values of the daily totals of radiation balance were 81% lower than in the open field due to the difference in the amount received and the characteristics of the forest floor surface. Data on the temperature of the ground surface and of the air at the height of 0.2 and 1.5 m and the relative humidity of the air showed that the differences between the forest and the field were unimportant. Differences of meteorological data obtained in different weather conditions were important: after rain periods it was colder in the forests than in the field. This was due to difference in wind velocity and in the value of the turbulence coefficient, as well as in the expenditure of heat in warming up the soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05350

AN EXAMPLE OF LONGEVITY OF PINE ON A PEAT BOG, (IN RUSSIAN),
V. G. Rubtsov.
Lesovedenie. 6. p 104-107, 1970. (English summary).
Identifiers: Bogs, Drainage, Morphology, *Peat bog, *Pine longevity, Sphagnum.

Studies were conducted in a 230-yr-old shrub-Sphagnum pine forest. The geomorphological structure of the bog is characterized by drainage and a comparatively high trophic value of the peat. It differs from similar bogs which are confined to the watersheds and hillocky dunes, where the trophic value of peat is low. Shrub-Sphagnum pine forests react differently to drainage depending on the geomorphological structure of forest transitional bogs.--Copyright 1973, Biological Abstracts, Inc.
W74-05351

CONTRIBUTION TO THE METHOD FOR THE DETERMINATION OF SUBLETHAL WATER DEFICIT,
P. Weinberger, M. Romero, and M. Oliva.
Flora (Jena), Vol 161, No 5/6, p 555-561, 1972, Illus, English summary.
Identifiers: Methods, *Sublethal limit, *Water deficit, *Saturation.

The sublethal water deficit is a highly variable feature. By a common statistical procedure, determination of the correlation between water deficit and reachable re-saturation, it is possible to establish a specific value of each species, this value being easily reproducible. This corresponds to a re-saturation of only 90% of the initial maximum value.--Copyright 1973, Biological Abstracts, Inc.
W74-05365

STOMATAL RESPONSES TO CHANGES IN TEMPERATURE AT INCREASING WATER STRESS,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
E. D. Schulze, O. L. Lange, L. Kappen, U. Buschbom, and M. Evenari.
Planta (Berl), Vol 110, No 1, p 29-42, 1973, Illus.
Identifiers: Artemisia-herba-alba, Hammada-scoparia, Humidity, *Israel(Negev), Prunus-armeniaca, Reaumuria-negevensis, *Stomatal response, *Temperature, Water stress, Zygophyllum-dumosum, Transpiration(Plants).

The response of stomata to a gradual increase in temperature at increasing plant water stress was studied in a hot desert habitat (Negev, Israel) in the field, but under controlled temperature and humidity conditions. Four native species (Zygophyllum dumosum, Artemisia herba-alba, Hammada scoparia, Reaumuria negevensis) and 1 cultivated plant (Prunus armeniaca) were used in these studies. The stomatal response to temperature was compared with the response in well-irrigated plants of the same species. At low water stress, the diffusion resistance for water vapor decreased in response to a gradual increase in temperature. Transpiration increased accordingly. This response was reversible. All species responded in the same way. The opening of stomata with increasing temperature was apparently independent of the stomatal response regulated by atmosphere humidity. At high plant water stress, the stomatal response was reversed, i.e., the stomata closed when temperature was gradually increased. This stomatal closure was also independent of the closure regulated by atmospheric humidity. The plant water potential at which the stomatal response to temperature was reversed differed among the species investigated.--Copyright 1973, Biological Abstracts, Inc.
W74-05366

CONTRIBUTION TO KNOWLEDGE OF MAYFLIES OF THE AMUR BASIN: I. IMAGINES (EPHEMEROPTERA:EPHEMERELLIDAE), (IN RUSSIAN),
O. Ya. Baikova.
Izv Tikhookean Nauchno-Issled Inst Rybn Khoz Okeanogr. 77. p 178-206. 1972.
Identifiers: *Ephemerella, Ephemerellidae, Ephemeroptera, Imagines, *Mayflies, *USSR(Amur basin), *Insects, Invertebrates.

For the first time a description is presented of the imaginal forms of 4 spp. of the genus Ephemerella previously known only on the basis of larvae; supplements to the descriptions of imagines are given for other species. The data on the relationship of the segments of the tarsus, tibia and femur of mayflies of the investigated genus and quantitative indices characterizing the size and weight of winged individuals are presented. Information on some aspects of the biology of the species is given. (See also W74-05381)--Copyright 1973, Biological Abstracts, Inc.
W74-05380

CONTRIBUTION TO KNOWLEDGE O MAYFLIES (EPHEMEROPTERA) OF TH AMUR BASIN: II. IMAGINES (RHITHROGEN/ HEPTAGENIA), (IN RUSSIAN),
Izv Tikhokean Nauchno-Issled Inst Rybn Kh Okeanogr. 77. p 207-232. 1972.
Identifiers: Ephemeroptera, *Heptageni Heptagenia-Arsenjevi, Heptagenia-Chinens Heptagenia-Flava, Heptagenia-Soldato Imagines, *Mayflies, Rhithrogena, Rhithroge Imanica, Rhithrogena-Unicolor, *USSR(Am basin), *Insects, Invertebrates.

As a result of breeding winged forms from larv of Rhithrogena un--olor the identity of this speci with R. lepnevae was established. The fem imagines of R. lepnevae are described for the fi time. A description of R. imanica (Ussuri basin) given. A determinative table of similar species Rhithrogena of the Asiatic part of the USSR a Eastern countries is presented. Winged forms Heptagenia soldatovi and H. arsenjevi, previou known only by larvae, are described for the fi time. However, a comparison of the morpholo cal structures of the Polish and Lithuanian larv and imagines of H. flava with the Amur species arsenjevi did not confirm a difference of th species. The species H. chinensis, described fr male imagines from China, is recorded for the fi time for fauna of the USSR. A description of previously known female imagines of this spec is given. The species H. tobiironis, H. yoshi and H. kibunensis are presented for the first ti for the Amur basin in a winged form. A determi tive table of the imaginal stage of all species Heptagenia is presented. (See also W 05380)==Copyright 1973, Biological Abstrac Inc.
W74-05381

2J. Erosion and Sedimentation

ACKER LAKE LANDSLIDE, MONROE COU TY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
D. M. Keady, E. E. Russell, and T. J. Laswell.
Available from the National Technical Infor tion Service as PB-228 697 $4.25 in paper co $1.45 in microfiche. Information Series MGS-7 1973. 22 p, 13 fig, 11 ref. OWRR A-058-MISS(2

Descriptors: *Landslides, *Mass wast *Mississippi, Joints(Geologic), F tures(Geologic), Permeability, Stream eros Loess, Clays, *Erosion.
Identifiers: *Tombigbee River(Miss.), *Ac Lake(Miss.).

Mass wasting in the Tombigbee Sand Membe the Eutaw Formation (Upper Cretaceous) i common occurrence on steep bluffs in northe ern Mississippi. The most recent documented s occurred on Monday, April 27, 1970, in the vi ty of the small manmade Acker Lake, appr mately five miles north of Aberdeen. The Acker Lake landslide was not the result of a si factor, but was influenced by several variat Bluffs along the western valley wall of the T bigbee River are kept steep in the area of A Lake principally by the fact that the present c nel of the river is against the west valley wall i immediate area. Acker Lake furnishes a cont ing supply of water thus maintaining a moisture content, with accompanying weigh crease in permeable beds. This high moisture tent probably increases pore pressure decreases shearing strength in the sands. He rainfall during March and April of 1970 brough increase in stream energy thus enabling the T bigbee River to remove material from the bas slides formed at an earlier period. A contin clay bed at depth provided a surface along w initial lateral movement could occur. Joint

ombigbee Sand, prominent along the bluff face, robably provided passageway for more rapid ovement of water than would have otherwise oc-rred. The conditions that led to the 1970 slide are sentially unchanged, therefore continued sliding this type is likely. (Knapp-USGS)
74-04862

OTES ON SEDIMENTATION ACTIVITIES, ALENDAR YEAR 1971.
ater Resources Council, Washington, D.C. Sedi-entation Committee.
vailable from NTIS, Springfield, Va. 22151, PB-21 081 for $3.00 printed copy; $1.45 microfiche. ater Resources Council Report US-WRC-0100-, Prepared by National Oceanic and Atmospher-Administration, October 1971. 245 p.

escriptors: *Sedimentation, *Research and velopment, Federal government, Sediment ansport, Projects, Research facilities.

digest is presented of information furnished by l Federal agencies conducting sedimentation in-estigations on work in progress or planned, im-rtant findings, new methods, new publications, boratory and other research activities, and other rtinent information. The material has been or-anized by major drainage regions in the conter-inous United States, Alaska, Hawaii, Puerto ico, and other foreign countries. Other major adings include laboratory and other research ac-vities. Long-term water quality sites at which diment data have been collected are listed. napp-USGS)
74-04916

YDROLOGIC CHARACTERISTICS OF LDER CREEK, IRON COUNTY, WISCONSIN,
eological Survey, Madison, Wis.
or primary bibliographic entry see Field 4A.
74-04920

ERC BULLETIN AND SUMMARY REPORT F RESEARCH PROGRESS FOR FISCAL EARS 1965-66.
rmy Coastal Engineering Research Center, ashington, D.C.
or primary bibliographic entry see Field 2L.
74-04926

OME MODERN APPROACHES TO BEACH TUDIES,
oods Hole Oceanographic Institution, Mass.
M. Zeigler.
ceanography and Marine Biology, Annual eview, H. Barnes (Editor), Vol 2, p 77-95, 1964. 3 g, 3 tab, 60 ref.

escriptors: Coasts, *Beaches, *Waves(Water), Sediment transport, Geography, Currents(Water), Reviews, Equations, Rip cur-nts.
dentifiers: *Wind generated waves, *Longshore rrents, *Tidal currents, Solitary waves, earshore.

ollowing a historical approach to beach studies, arious physical concepts in the study of beach rocesses are examined. Modern observations are iscussed in terms of water movements. Equations hich relate to water movement or qualitative ex-ressions concerning the behavior of water ecome part of the problem under study, and mea-rement of the variables in these equations forms e basis for most modern field experiments. Also iscussed are concepts concerned with the trans-ort of material. The importance of treating the ariables synoptically and, in the field, geographi-ally as well is emphasized. (Sinha - OEIS)
74-04930

LITTORAL PROCESSES - QUANTITATIVE TREATMENT,10B. LE MEHAUTE.
In: Encyclopedia of Geomorphology. R. W. Fairbridge, Reinhold, p 667-672, 1968. 6 fig, 20 ref.

Descriptors: *Beaches, Geomorphology, *Littoral, Sand spits, Sand bars, *Waves(Water), Rip currents, Coasts, *Currents(Water), Winds.
Identifiers: Longshore transport, Longshore currents, Tombolos, Baymouth bars, Barrier beaches, Mass transport, Nearshore processes.

The origin of beaches and coastal material is described. Two-dimensional wave motion affecting beaches, and waves at an angle and currents affecting beaches are discussed. Illustrations show vertical distribution of mass transport with depth and wind effects noted, longshore transport, rip currents and typical singularities in littoral physiography. The singularities are identified as spits, baymouth bars, barrier beaches and tombolos. (Sinha-OEIS)
W74-04931

NEARSHORE PROCESSES,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W74-04932

SEDIMENTARY RESPONSE TO HYDROGRAPHY IN AN OREGON ESTUARY,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-04934

EXPERIMENTAL DETERMINATION OF RUN-UP OF UNDULAR AND FULLY DEVELOPED BORES AND AN EXAMINATION OF TRANSITION MODES AND INTERNAL STRUCTURE,
Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
For primary bibliographic entry see Field 8B.
W74-04936

PRECISE CONTROL OF WAVE RUN-UP IN BEACH RIDGE CONSTRUCTION,
Florida State Univ., Tallahassee. Dept. of Geology.
W. F. Tanner, and F. W. Stapor.
Zeitschrift fuer Geomorphologie N. F., Vol 16, No 4, p 393-399, December 1972. 1 fig, 6 ref, 1 photo.

Descriptors: *Beaches, Slopes, Sands, Berms, Sediments, Tides, Waves(Water).
Identifiers: *Wave energy, *Beach ridges, Washover, Tidal range, *Wave run-up, Swash zone.

Beach ridge growth is essentially the work of wave run-up in the swash zone, with little or no washover effects. An approximate method is provided whereby wave height can be estimated from beach ridges. Under given sediment supply and wave conditions, run-up distance and beach face slope are rigidly related. This relationship is such that, with constant wave energy and no tidal change, the waves reach the top of the beach, neither more nor less. If deposition of sand is taking place on the beach, a small berm may be deposited in the upper part of the run-up range. Under constant conditions of deposition, this berm will grow upward and seaward into a beach ridge, having almost all of its internal bedding dipping toward the sea. Highly energetic waves will reach the top of the ridge, but there will be little wash-over. Addition of variability of waves and tide provides only that construction take place in the upper part of the tidal range, under higher-than-average wave energy levels. Elimination of the supply of excess sand puts an end to construction. (Sinha-OEIS)
W74-04939

COASTAL CIRCULATION NEAR KAKINADA BAY DURING MONSOON PERIOD,
Andhra Univ., Waltair (India). Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 2L.
W74-04941

SOME THREE-DIMENSIONAL EFFECTS IN SURF,
Brown Univ., Providence, R.I. Div. of Applied Mathematics.
R. B. Turner, and R. E. Meyer.
Available from NTIS as AD-605 662 for $6.00 paper copy, $1.45 microfiche. Technical Report No. 6, August 1964. 16 p, 1 fig, 4 ref. Nonr 562(34).

Descriptors: *Surf, *Water(Waves), *Shallow water, *Beaches, Equations.

Asymptotic equations are presented of surf on shallow beaches with a geometry causing longshore variations in the water motion. In general, such surf is found to be governed by the three-dimensional, nonlinear shallow-water equations. However, when the seabed profile parallel to shore is shallower than the profile normal to shore, the asymptotic equations are shown to differ only in minor respects from those of two-dimensional surf. Such 'weakly three-dimensional' surf can be analysed directly in terms of the results of the two-dimensional theory. (Sinha-OEIS)
W74-04942

LONGSHORE CURRENTS GENERATED BY OBLIQUELY INCIDENT SEA WAVES,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2E.
W74-04943

CAUSE AND PREDICTION OF BEACH EROSION,
National Weather Service, Garden City, N.Y. Eastern Region.
S. E. Wasserman, and D. B. Gilhousen.
Technical Memorandum NWS ER-55, November 1973. 11 p, 3 fig, 1 tab, 5 ref.

Descriptors: *Beach erosion, Oceanography, Meteorology, *Littoral drift, *Sediment transport, Sands, Atmospheric pressure, Fetch, Tides, New York, New Jersey.
Identifiers: Long Island(NY), *Wind-driven currents, *Longshore currents.

Oceanographic and meteorological factors involved in beach erosion can be isolated. Surface wind and pressure conditions associated with known beach erosion cases have been presented, and products operationally available to assist in predicting these conditions have been itemized. It is not known how often beach erosion does not occur when the wind and pressure conditions are favorable. Shifting sands, which continuously change near the coastal underwater topography, and tide conditions play an important role in controlling the beach erosion process. While hurricanes and tropical storms do cause major damage along the beaches, they are not considered in this study. The most damaging beach erosion is caused by a fetch directed along the coastline with an onshore component. The wind-driven steep waves stir up the sand and fine gravel and tend to eat away at the beaches. Then a longshore current, or 'littoral drift' is required to transport the loosened sand, if the erosion process is to continue. High tides, that are necessary for the erosion process to penetrate inland above the normal beach line, can be due to storm surges, lessening atmospheric pressure on the adjacent ocean surface, or the direction of the longshore current, in addition to the normal astronomical tides. (Sinha-OEIS)
W74-04945

EDGE BORES,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 8B.
W74-04948

COASTAL MOVABLE BED SCALE MODEL TECHNOLOGY,
Tetra Tech, Inc., Pasadena, Calif.
L-N. Fan, and B. Le Mehaute.
Final Report Tetra Tech No TC-131, prepared for Army Coastal Engineering Research Center, June 1969. 122 p, 20 fig, 9 tab, 68 ref, 2 append. DACW72-68-C-0020.

Descriptors: *Sediment transport, *Coasts, *Waves(Water), *Model studies, Coasts, Data processing.
Identifiers: Littoral transport, Similitude relationships, Scale effects.

The historical development, applications, limitations and basic requirements of coastal movable bed model technology are reviewed. Similitude relationships are established based upon important parameters governing coastal sediment transport. Relationships proposed by previous investigators are critically reviewed. Four basic scale ratios, namely, horizontal scale, vertical scale (or distortion), sediment size and specific weight can be determined from established similitude relationships. Possible scale effects are analyzed. A standard procedure is recommended. This procedure includes data acquisition, data correlation, choice of scales and artificial sediments, preliminary wave tank experiments, adjustment of the model, determination of time scale of bed evolution, interpretation of results and scale effects. A formula is suggested for estimating the time scale of bed evolution due to littoral transport by waves. These results should be useful in both evaluating and utilizing the movable bed model as a tool in coastal engineering problems. (Sinha-OEIS)
W74-04949

ESTUARY AND COASTLINE HYDRODYNAMICS.
For primary bibliographic entry see Field 2L.
W74-04950

COASTAL PROCESSES,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04951

SEDIMENTATION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04955

THE INTERNAL VELOCITY FIELD IN BREAKING WAVES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
R. L. Miller, and J. M. Zeigler.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 7, p 103-122, 1964. 9 fig, 27 ref.

Descriptors: *Waves(Water), *Tidal effects, Shores, Coasts, *Shallow water, Shoals, *Sediment transport.
Identifiers: *Breaking waves, *Shoaling, Nearshore processes, Velocity field patterns, Breakers.

The results presented are the first detailed measurements of the horizontal velocity component inside breaking waves. The field study was originally undertaken in 1960 to determine the presence and strength of mid-depthreturn flow under shoaling waves. In the course of the experiment, a series of measurements was made very close to the shore. During one tidal cycle, the instruments became exposed to breakers, and continued to operate. A study of the resulting data showed that detailed velocity measurements could be made within the natural breaker in the field. Accordingly, a series of runs was made and velocity data collected on breakers ranging from very small to storm size. The results very strongly suggest that different breaker shapes have different internal velocity fields. It is possible that the initiation of instability and the subsequent development of the breaker may be characterized by one or several vortex systems, as suggested by the velocity field patterns. The breakers studied were of the type that break directly on the shore and include within the sequence , the runup and backwash from the foreshore. (Sinha - OEIS)
W74-04960

THE COASTLINE OF RIVER-DELTAS,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
For primary bibliographic entry see Field 2L.
W74-04961

THEORETICAL FORMS OF SHORELINES,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
For primary bibliographic entry see Field 2L.
W74-04962

SEASONAL CHANGES IN BEACHES OF THE NORTH ATLANTIC COAST OF THE UNITED STATES,
Army Coastal Engineering Research Center, Washington, D. C.
J. M. Darling.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 15, p 236-248, 1964. 8 fig, 5 tab, 4 ref.

Descriptors: *Beach erosion, *Seasonal, Erosion, Deposition(Sediments), *Tides, New Jersey, New York, Rhode Island, *Waves(Water), Coasts, Storms.
Identifiers: Nearshore processes, Wave period, Wave steepness.

Seasonal changes of eight Atlantic Ocean beaches along the East Coast of the United States from southern New Jersey to Rhode Island have been under study since September 1962. Changes in the beach profiles to date indicate variations on a seasonal basis. Analysis of surveys made at Atlantic City covering a period of little more than one year, indicate marked seasonal differences in beach conditions. The waves during the erosion periods were characteristically of greater steepness than those of the accretion period. The seasonal trend inferred from data for Atlantic City seems to prevail in varying degrees at all the beaches under study, with the possible exception of those fronting on Long Island Sound rather than the Atlantic Ocean. It must be recognized that the actual erosion or accretion does not occur as a continuous pattern, but there are periods which are dominated either by erosion or accretion. These seasonal trends are then the net or resultant behavior pattern. (Sinha - OEIS)
W74-04963

QUASI-WEEKLY AND DAILY PROFILE CHANGES ON A DISTINCTIVE SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W74-04964

WAVE ENERGY AND LITTORAL TRANSPORT,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
J. Castanho.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 17, p 259-266, 1964. 3 fig, 1 ref.

Descriptors: Bores, *Waves(Water), *Littoral drift, *Sediment transport, Coasts, Energy.
Identifiers: *Wave energy, *Breaking waves.

In this discussion of wave energy and littoral transport, the following aspects are considered: energy dissipated by friction losses; energy contained in the longshore current; and energy dissipated by breaking waves. The momentum method is used in calculating the mean velocity of the longshore current. Energy fractions dissipated in friction losses, breaking losses and solid discharge are also calculated. (Sinha - OEIS)
W74-04965

QUANTITATIVE RESEARCH ON LITTORAL DRIFT IN FIELD AND LABORATORY,
Florida Univ., Gainesville. Coastal Engineering Lab.
P. Bruun, and J. Purpura.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 18, p 267-288, 1964. 11 fig, 2 tab, 25 ref.

Descriptors: *Florida, *Littoral drift, *Sediment transport, Shear stress, Bed load, *Waves(Water), *Currents(Water).

A combined field and laboratory research program is underway to gain quantitative information on littoral drift longshore as well as perpendicular to the shore. The laboratory utilizes modern tracing techniques by luminophores including a scanning (counting of grains) machine and experiments in a wave tank where a current is passed through waters agitated by waves propagating parallel to or perpendicular to the current action. Modes of sediment transport examined are sheet layer movement and transverse movement. In the laboratory studies have been made on transport by wave action, transport by wave and flow action (propagation unidirectional), and wave and current action operating under an angle with each other. (Sinha - OEIS)
W74-04966

SAND LOSSES FROM A COAST BY WIND ACTION,
California Univ., Berkeley. Coll. of Engineering.
J. W. Johnson, and A. A. Kadib.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 24, p 368-377, 1964. 3 fig, 6 tab, 6 ref.

Descriptors: *California, *Sediment transport, *Wind erosion, *Dunes, *Sands, Equations, *Beach erosion.

A procedure is outlined for the calculation of the annual rate of transport of sand that might be expected to be carried inland from a natural beach by wind action. The procedure involves the beach composition and alinement, the frequency of winds of various speeds from various directions and a suitable formula to describe the transport. It is possible that the transport formula may be altered as a result of current research; however, the general procedure as outlined should apply. (Sinha - OEIS)
W74-04967

RESIDENCE TIME OF SAND COMPOSING THE BEACHES AND BARS OF OUTER CAPE COD,
Woods Hole Oceanographic Institution, Mass.
J. M. Zeigler, S. D. Tuttle, G. S. Giese, and H. J. Tasha.

n: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 26, p 403-46, 1964. 6 fig, 3 tab, 8 ref.

Descriptors: *Sediment transport, *Beaches, Sand bars, *Erosion, Deposition(Sediments), Massachusetts.
Identifiers: *Cape Cod(Mass), Residence time.

Residence time is defined as the average number f years a grain of eroded sediment is likely to pend in a specific area before it is transported elsewhere. Sediment seems to take a preferred path, ome of it moving along the beach and some along he bars. The time scale is limited to the past eventy years, the time for which data were availale. The geographical position is limited to a strip f the east coast of Cape Cod extending seaward o where water depth is about forty feet. The ethod used to compute residence time involves olume stability. In as much as there is neither ain nor loss of the average volume of sand built eatures, sand must be moving out of the study rea at the same rate it is being introduced. Therefore, the residence time in years is the average olume of a beach or bar divided by the yearly olume of sediment added by erosion to the beach r bar. The east coast of Cape Cod is uniquely situted for a study such as this because sediment is ntroduced into the definition area only by erosion ithin the area of the cliffs or sea floor. No sediment or very little of it is introduced into the study rea by means of littoral drift. (Sinha - OEIS)
W74-04968

THE ASH WEDNESDAY EAST COAST STORM, MARCH 5-8, 1962. A HINDCAST OF EVENTS, CAUSES, AND EFFECTS,
National Engineering Science Co., Washington, D.
C. L. Bretschneider.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 41, p 617-59, 1964. 28 fig, 1 tab, 31 ref.

Descriptors: *Storms, *Winds, *Waves(Water), Tides, Coasts, Calibrations, *Storm surges, Beaches, Dunes, Data.
Identifiers: Hindcasts, Gusts.

The material presented represents a hindcast of vents during the March 6-8, 1962, storm along the ast coast of the United States. Specifically the indcasts include (1) deep water waves, waves ver the continental shelf, waves in shallow water, nd waves at the coastline; (2) total tide, including ormal predicted tide, storm surge and wave setp; (3) wave run-up on the beach and an estimation f beach berm and dune erosion; (4) wind speeds ver water, over the beach, and over the top of the unes. The hindcasts were checked with available ata for the storm. Numerous sources of information on the storm were available to improve the accuracy of the 'state of the art' in forecasting. The o-called 'calibrated methods' for hindcasting ere quite suitable for the present storm conditions. (Sinha - OEIS)
W74-04969

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
For primary bibliographic entry see Field 5B.
W74-05021

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W74-05023

MOVEMENT OF WATER ALONG THE SHORE AND NORMAL TO IT IN THE NEAR-SHORE ZONE OF A SHALLOW-WATER COAST,
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
For primary bibliographic entry see Field 2L.
W74-05028

COMPOSITE ENERGY FLUXES AS FACTORS IN COASTAL FORMATION,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 2L.
W74-05029

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
S. H. Hopkins.
Available from NTIS as AD-767 562, price $8.25 in paper copy, microfiche $1.45. Army Engineer Waterways Experiment Station, Contract Report H-73-2, August 1973. 411 p. DACW39-72-C-0002, DACW73-69-C-0043, DACW73-70-C-0004.

Descriptors: Salt marshes, Coastal marshes, Aquatic habitats, Marsh plants, Marshes, Environment, *Estuaries, *Aquatic animals, *Bibliographies, *Salinity, Coasts, *Biology, *Ecology, *Aquaculture, *Aquatic plants.

Abstracts are given for some 1429 published and unpublished reports dated 1972 and earlier, on physiological and ecological effects of salinity, salinity differences, and changes in salinity on organisms living in estuaries and other coastal waters. Author and subject indexes are included. Authors are listed alphabetically and each author's works are listed chronologically. The subject index provides for cross-indexing by subject. (Sinha - OEIS)
W74-05031

HYDROGRAPHIC ATLAS OF NORTH CAROLINA ESTUARINE AND SOUND WATERS, 1972,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
F. J. Schwartz, and A. F. Chestnut.
Available from NTIS as COM73-11408, price $4.50 in paper copy, microfiche $1.45. Sea Grant Publication UNC-SG-73-12, June 1973. 132 p, 43 fig, 83 tab, 8 ref. SG-04-3-158-40.

Descriptors: North Carolina, *Estuaries, *Water temperature, *Salinity, Sounds, Isotherms, Hydrography.
Identifiers: Isohalines, Atlases.

An atlas of figures, tables, and short text presents water temperature and salinity data for all North Carolina estuarine and sound coastal waters from Virginia to South Carolina except Currituck Sound. Monthly surface and bottom isohalines and isotherms are illustrated. Tables list actual raw determinations for these parameters. (Sinha - OEIS)
W74-05032

RHODE ISLAND'S BARRIER BEACHES: VOLUME II. REPORTS AND RECOMMENDATIONS AT THE COMMUNITY LEVEL,
Rhode Island Univ., Kingston. Coastal Resources Center.
S. B. Olsen, and M. J. Grant.
Available from NTIS as COM73-11045, price $3.00 in paper copy, microfiche $1.45. Marine Technical Report No 4, (A Coastal Management Publication), 1974. 114 p, 17 fig. NOAA Grant.

Descriptors: Rhode Island, *Barrier islands, Coasts, *Beaches, *Management, *Land use, Conservation, Land development, *Community development.

The report is designed to supplement Rhode Island's Barrier Beaches: Volume I - A Report on a Management Problem and an Evaluation of Options. Both documents are elements in a study prepared for the State Coastal Resources Management Council by the University of Rhode Island's Coastal Resources Center. Individual beaches are examined on a community-by-community basis. A consolidated Table of Contents for Volume I and II is included. A location map identifies the barrier beach areas which were studied. Land use and natural feature maps were completed for all barrier beaches and a number of these appear in this volume. (Sinha - OEIS)
W74-05033

NONLINEAR DEVELOPMENT OF THE RAYLEIGH-TAYLOR INSTABILITY IN THE 'SHALLOW-WATER' APPROXIMATION,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-05034

EXPERIMENTAL STUDIES OF BEACH SCOUR DUE TO WAVE ACTION,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
W. O. Song, and R. E. Schiller.
Available from NTIS as COM73-11745, $4.25 in paper copy. Sea Grant Publication TAMU-SG-73-211, Coastal, Hydraulic, and Ocean Engineering Group Report No. 166 C.O.E., July 1973. 96 p, 31 fig, 2 tab, 40 ref, 4 append. NOAA SG 2-35213, 04-3-158-18.

Descriptors: Coasts, *Beaches, *Scour, Regression analyses, *Waves(Water), *Shallow water, *Sea walls.
Identifiers: Seawall beaches, Standing waves, Beach scour, Wave action.

The processes were investigated involved in the formation of beach scour, caused by wave action, on a natural beach and a seawall beach. Studies also took into account the determination of the reflection coefficient which characterized the wave reflected from both the seawall and the deformed beach profile. The standing wave, formed by the reflection of the waves, was found to be important in the analysis of beach scour phenomena. For the calculation of the reflection coefficient, two methods were used: the envelope method and the Coastal Engineering Research Center (CERC) method. The results showed excellent agreement. The linear standing wave theory was compared with the second order standing wave theory. The wave surface profile and the corresponding horizontal and vertical velocity components of the water particles at the designated points on the free water surface were calculated on the basis of the two theories. The results indicate that the linear standing wave theory gives good results as a first approximation.

To predict the scour depth on the natural beach and the seawall beach, regression analyses were performed. The results gave excellent correlation. (Sinha - OEIS)
W74-05035

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
For primary bibliographic entry see Field 5B.
W74-05038

WAVE PROPAGATION IN CONTINUOUS RANDOM MEDIA,
California Univ., Los Angeles. Dept. of Mathematics.
C. G. Lange.
Available from NTIS as AD-768 197, price $3.00 in paper copy, microfiche $1.45. Report, 1970. 32 p, 8 ref. ONR Contract N000-14-69-A-0200-4022.

Descriptors: *Waves(Water), Energy, *Stochastic processes, Mathematical studies, Statistics, *Gravity waves, Equations.
Identifiers: Wave propagation, Bottom topography, Random media.

The way in which small random inhomogeneities in a transmission medium affect the statistical properties of a system of waves was studied. Provided the spectral cumulants are sufficiently smooth at some initial time, a sequence of closures for the zeroth order spectral functions can be deduced which describe asymptotically the transfer of energy between wave numbers. Of particular importance is the fact that the closure equations are derived without the need to resort to ad hoc statistical assumptions. The general theory is applied to the problem of the propagation of water waves over an irregular bottom topography. (Sinha - OEIS)
W74-05041

EXISTING AERIAL PHOTOGRAPHIC RESOURCES OF COASTAL GEORGIA AND A BRIEF LISTING OF INTERPRETATIVE AIDS,
Georgia Univ., Sapelo Island. Marine Inst.
R. A. Linthurst, and R. J. Reimold.
Available from NTIS as COM73-11452, price $3.50 paper copy, microfiche $1.45. Sea Grant Publication, Technical Report Series No 73-4, June 1973. 41 p, 34 ref, 7 append, 4 infold maps. NOAA.

Descriptors: Resources, Georgia, *Aerial photography, Coasts, Shallow water, Surveys, Satellites(Artificial), Photogrammetry.
Identifiers: Gemini, Apollo.

The available store of photographic information of the Georgia coast including acquisition, interpretation, and utilization of aerial photography is summarized. Information is given on photogrammetric equipment, photographic systems, aeronautical sectional charts and topographic maps, tidal data, and coastal protection agencies. (Sinha - OEIS)
W74-05042

SEDIMENTARY PROCESSES ON THE CONTINENTAL SLOPE OFF NEW ENGLAND,
Woods Hole Oceanographic Institution, Mass.
J. C. MacIlvaine.
NTIS as AD-768 284, $5.50 in paper copy. Technical Report No. WHOI-73-58, September 1973. 211 p, 51 fig, 4 tab, 64 ref. ONR Contract N00014-66-C0241.

Descriptors: New England, Massachusetts, *Sedimentation, *Continental slope, *Sediment transport, Geomorphology, *Turbidity currents, Creep, Hydrodynamics, Biology.
Identifiers: Cape Cod(Mass), Bottom currents, Quaternary, Oceanographic data, Gravitational processes, Slumping.

A small area of the continental slope south of Cape Cod, Massachusetts was studied. Gravitational processes (slumping, creep, and turbidity currents) are apparently the most effective erosional processes. Massive large-scale failure occurs where the slope steepens from a gradient of 1.5 deg to 7.6 deg, producing scarps hundreds of meters in relief. Smaller scale slumping occurs on the other parts of the continental slope. Material removed by slumping is emplaced at the foot of the continental slope as intact and disrupted blocks 1 to 100 m thick. Turbidity currents generated by slumping have apparently eroded V-shaped gullies in the lower continental slope. Bottom currents are most influential at the shelf break, where they produce sorting of surface sediments and suspension of fine material by erosion of the bottom. Laboratory flume experiments and observations of the bottom indicate that the sediments of most of the continental slope are not normally affected by bottom currents. Biological activity causes both roughening and smoothing of the sediment surface. Tracking of the bottom produces small-scale roughness, and reworking of the bottom reduces larger roughness elements. Biological production of fibrous structures help render the the sediment surface extremely resistant to erosion by bottom currents. (Sinha - OEIS)
W74-05043

INFLUENCE OF PARENT MATERIAL AND SLOPE EXPOSURE ON PROPERTIES OF SOILS RELATED TO ERODIBILITY IN NORTH CENTRAL ANATOLIA,
Forstliche Forschungsanstalt, Munich (West Germany). Institut fuer Bodenkunde.
A. N. Balci.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 42-45, 1972.
Identifiers: Clay, Gravel, *Organic matter, *Slope erosion, Soils, *Turkey(Anatolia), *Soil erosion.

The soils developed from 4 different parent materials in the study area were highly erodible. Parent material has strong influence on soil properties related to erodibility. Dispersion ratio as an index of erodibility and various other soil properties in relation to 4 different parent materials were found to be significantly different. The relative differences in inherent potential erodibility of soils developed from various parent materials may be ranked on the basis of dispersion ratio as follows: Neocene silt greater than Sandstone greater than Andesite greater than Conglomerate. The soils developed on southern slopes were found to be significantly more erodible than those on northern slopes. The relatively better soil stability on northern slopes may be attributed to the significantly higher contents of organic matter and clay fraction. Organic matter contents of surface soil layers (0-15 cm) were found to be significantly higher than those of subsurface (15-30 cm) soil layers. This relation was reserved for gravel content and particle density. Organic matter, gravel, and clay contents of soils showed highly significant inverse associations with dispersion ratio whereas electrical conductivity and silt content indicated significant positive correlation with the erodibility. Several useful relations were found between dispersion ratio and various other soil properties and the results are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-05066

EXPERIMENTAL STUDY OF RIVER INCISION,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
R. G. Shepherd, and S. A. Schumm.
Geological Society of American Bulletin, Vol 85, No 2, p 257-268, February 1974. 20 fig, 3 tab, 29 ref. NSF Grant GA-27726.

Descriptors: *Erosion, *Stream erosion, *Channel erosion, Hydraulic models, Scour, Channel morphology, Flumes.
Identifiers: River incision.

River incision was studied in simulated bedrock, a mixture of sand and kaolinite. Slope, sediment feed, and water discharge were controlled during the development of four channels. After an increase of slope at constant discharge, the following sequence of erosion occurred: (1) development of longitudinal lineations, ripples, and potholes; (2) enlargement of the lineations into prominent grooves; (3) coalescence of the grooves into a single, narrow, and deep inner channel. The inner channel was incised below base level and a sequence of bedrock lows and highs formed. Bedrock scour lows had a weakly regular spacing during incision and a randomly clustered spacing following aggradation. Incision around stabilized alternate bars in a sinuous sand-bed channel resulted in destruction of the bars and maximum scour where the flow was locally constricted. In an initially sinuous bedrock channel, scour depth was greater at bends than at crossings. Provided all of the available sediment load was entrained, the bed was eroded more at convex banks of bends than at concave banks. However, after deposition occurred, the maximum erosion shifted to the concave bank. These results indicate that lateral or vertical incision at bends of incised meandering streams is controlled by the amount of available sediment load entrained by channel-forming discharges. Incised meanders superposed from an earlier pattern on a peneplain should rarely occur in nature, if epeirogenic tilting caused the incision. (Knapp-USGS)
W74-05134

WHAT FUTURE FOR NIAGARA FALLS,
Cornell Univ., Ithaca, N.Y. Dept. of Geological Sciences.
S. S. Philbrick.
Geological Society of American Bulletin, Vol 85, No 1, p 91-98, January 1974. 2 fig, 18 ref, append.

Descriptors: *Erosion, *Waterfalls, *New York, Gradients(Streams), Stream erosion, Geomorphology, Thalweg.
Identifiers: *Niagara River, *Niagara Falls.

The future recession of Niagara Falls up the thalweg of Niagara River is described. The fastest rate of recession occurs in the notched configuration when rock bursts result from high stresses in the rock, as they did several times during the nineteenth century. Conversely, the slowest rate of erosion is during the stable arch configuration such as has prevailed during the first three quarters of the twentieth century. Upstream migration of the Horseshoe Falls will lower the level of the Chippawa-Grass Island Pool below the bottom of the American Channel and unwater the American Falls. The level of Lake Erie may be lowered a few feet at this time. Because the top of the Lockport Formation dips beneath the surface and the Salina rocks appear, the upper part of the valley will cease to be a dolomite cliff and will become a much flatter-sloped outcrop of the less resistant Salina rocks. As the falls recede upstream, the continued upstream dip of the strata will lower the base of the Salina and increase the height of the Salina exposure to produce a distinctly broader flatter gorge quite different in appearance from the Lockport Gorge. The Final Falls will be much lower than the preceding Horseshoes and may be so slow in recession as to be a quasi-stationary falls, without immediate change in the level of Lake Erie. (Knapp-USGS)
W74-05135

EOLIAN ORIGIN OF MICA IN HAWAIIAN SOILS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2G.
W74-05136

RHODE ISLAND'S BARRIER BEACHES VOLUME I, A REPORT ON A MANAGEMENT

PROBLEM AND AN EVALUATION OF OPTIONS,
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 2L.
W74-05152

DISTRIBUTION OF CESIUM-137 IN A SMALL WATERSHED IN NORTHERN MISSISSIPPI,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W74-05191

EFFECT OF AN EXCEPTIONAL STORM ON SOIL CONSERVATION AT SAMARU, NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
I. Kowal.
Samaru Res Bull. 141, p 163-173. 1972.
Identifiers: Cultivation, *Nigeria(Samaru), Ridges, Runoff, *Soil conservation, Storms(Severe), Corn(Field), *Erosion control.

An exceptionally heavy storm over the Samaru catchment basin was unevenly distributed. Rainfall ranged from about 6 to 2 inches over a distance of several miles. The peak intensity of the storm reached 11.4 inches/hr with intensities of between 7.7 and 8.5 inches/hour maintained for 25 min. The average rainfall received by the catchment basin was 2.8 inches of which 44% was accepted causing a rise in the water-table of about 14 inches. The remaining 1.6 inches were lost in run-off, about 10% of which drained in 12 hr. A cultivated bench terrace on a uniform slope of 1:320, 200 yards long and with a catchment area of about 0.3 acre, supporting maize on 3-foot ridges gave the highest run-off (57%), while from terraces planted with maize without ridges under similar conditions of slope and catchment area the run-off rate was only 9% to 44% of the rainfall. Soil conservation measures at Samaru farm were effective in rapidly removing a high volume of run-off and in preventing flooding without damage to the main watercourses. The storm considerably reduced the size of ridges often undermining the plant support and causing lodging of certain crops. On the few non-ridged terraces, no excessive erosion was observed and there was no lodging of crops. The safe spacing of graded terraces against rill erosion was tentatively assessed to be an interval of 180 ft at 1.4% slope. The merits of ridges and flat cultivation with and without effective soil conservation measures are discussed. With adequate soil conservation such as that afforded by graded or bench terraces, flat cultivation has many advantages over ridging under mechanized farming.--Copyright 1973, Biological Abstracts, Inc.
W74-05340

PREDICTION OF THE START OF EROSION IN THE LIGHT OF PRINCIPLES OF RELIABILITY THEORY, (IN RUSSIAN),
Ts. E. Mirtskhulava.
Dokl Adad S-Kh Nauk. 12, p 39-41. 1972.
Identifiers: *Erosion, *Model studies, Prediction, River, Silt, Suspension, *Reliability theory.

The method proposed for predicting the start of erosion with the use of the principles of reliability is imperfect, but it led to the construction of a sufficiently simple model for estimating this important stage of erosion. The value of the study consists not so much in results obtained as in the proof of the possibilities opened by the principles of reliability theory for solving many analogous problems governed by stochastic parameters and overshoots of random functions (suspension, deposition and transport of silt, deformations of river beds, etc.).--Copyright 1973, Biological Abstracts, Inc.
W74-05347

RESULTS OF A SECOND STUDY OF WIND-ERODED SOILS IN THE PAVLODAR PRIIRTYSHYE (IN RUSSIAN),
E. D. Kuzmina.
Biol Nauki, Vol 15, No 10, p 117-121, 1972.
Identifiers: Clays, Sand, Silt, Soils, USSR, Winds, *Soil erosion, *Erosion control, *USSR(Pavlodar Priirtyshye), *Soil treatment.

Results from a 5-yr follow up experiment showed a 10-fold decrease in soil erosion due to application of certain soil protection measures--the increase of sand and clay and the decrease of small or fine sand and coarse silt. Other important factors responsible for controlling erosion were an increase in humus, moisture and annual cultivation of the soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05369

2K. Chemical Processes

TRACE SOLUABLE ORGANIC COMPOUNDS IN POTABLE WATER SUPPLIES,
Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04855

SELECTIVE CHROMATOGRAPHIC SEPARATION OF URANIUM(VI) ON DEAE-CELLULOSE LAYERS IN DILUTE ACETIC ACID MEDIA,
Chiba Univ. (Japan). Lab. for Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W74-04864

IDENTIFICATION OF AROMATIC NITRILES BY REACTION PAPER CHROMATOGRAPHY,
Vyzkumny Ustav Organickych Syntez, Pardubice (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W74-04865

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
For primary bibliographic entry see Field 5A.
W74-04866

COULOMETRIC DETERMINATION OF IRON(II)-1,10-PHENANTHROLINE WITH CERIUM(IV),
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04867

DETERMINATION OF EIGHT METALS IN THE INTERNATIONAL BIOLOGICAL STANDARD BY FLAMELESS ATOMIC-ABSORPTION SPECTROMETRY,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
For primary bibliographic entry see Field 5A.
W74-04868

VOLTAMMETRIC BEHAVIOUR OF COPPER(III) AND ITS ANALYTICAL APPLICATIONS,
Siena Univ. (Italy). Istituto di Chimica Generale.
For primary bibliographic entry see Field 5A.
W74-04870

DETERMINATION OF THE ABSORPTION CAPACITY IN SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-04947

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
Ye. V. Petrakov, E. V. Kozlova, and N. A. Sargsyants.
Vestnik Leningradskogo Universiteta, No 12, Geologiya-Geografiya, No 2, p 74-77, June 1973. 4 fig, 1 tab, 6 ref.

Descriptors: *Water quality, *Fluorides, *Groundwater, Groundwater basins, Aquifers, Artesian aquifers, Rocks, Geologic time, Inorganic compounds, Salts, Alkaline water, Water temperature, Hydrogen ion concentration, Oxidation-reduction potential, Curves.
Identifiers: *USSR(Moldavia), Mineralization.

Fluoride concentrations in alkaline waters of the Moldavian artesian basin are extremely high, reaching 20 mg/liter in waters of Riphean-Eocambrian rocks and 13.5 mg/liter in waters of Silurian, Cretaceous, and Lower Sarmatian rocks. On the basis of its high rate of migration in alkaline waters of the basin, fluoride belongs to the category of very mobile and readily mobile elements. A relation is established between groundwater mineralization and fluoride content. Maximum fluoride concentrations correspond to a mineralization of 2-5 g/liter for waters of sedimentary rocks and 1-2 g/liter for waters of metamorphic rocks. With a further increase in mineralization, the amount of fluoride in groundwater decreases sharply. The chemical composition of groundwater has a positive effect on the leaching of fluoride from rocks and on fluoride migration. An increase in Na_2CO_3 and $NaHCO_3$ concentrations results in a higher fluoride content in groundwater and intensifies fluoride migration; an increase in $CaCO_3$ content retards fluoride migration. A change in pH, Eh, and water temperature has little effect on the fluoride concentration in groundwater of the Moldavian artesian basin. (Josefson-USGS)
W74-05016

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5B.
W74-05022

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W74-05023

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 4B.
W74-05080

CHEMICAL COMPOSITION OF MONSOON RAINWATER OVER CHANDIGARH IN 1971,
Central Groundwater Board, Faridabad(India).
For primary bibliographic entry see Field 2B.
W74-05130

PRELIMINARY STUDIES ON THE MECHANISMS CONTROLLING THE SALINITY IN NORTHWESTERN ARID REGION OF INDIA--A DISCUSSION ON THE CAUSES OF SALINITY IN THE GROUNDWATER REGIME,
Central Groundwater Board, Faridabad (India).
For primary bibliographic entry see Field 2F.
W74-05132

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE) ,
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2F.
W74-05147

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W74-05148

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-05156

GENERAL REPORT ON DEVELOPMENT AND UTILIZATION OF SALINE SOILS IN IRAN,
Jondi Shahpour Univ., Ahvaz (Iran).
For primary bibliographic entry see Field 3C.
W74-05218

FLUORIMETRIC METHOD FOR THE DETERMINATION OF URANIUM IN NATURAL WATERS,
Geological Survey of Sweden, Stockholm.
For primary bibliographic entry see Field 5A.
W74-05240

FIELD IONIZATION MASS SPECTROMETRY: A NEW TOOL FOR THE ANALYTICAL CHEMIST,
Stanford Research Inst., Menlo Park. Calif.
For primary bibliographic entry see Field 5A.
W74-05302

GRADIENT TITRATION-A NOVEL APPROACH TO CONTINUOUS MONITORING USING ION-SELECTIVE ELECTRODES,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
B. Fleet, and A. Y. W. Ho.
Analytical Chemistry, Vol 46, No 1, p 9-11, January 1974. 5 fig, 1 tab, 16 ref.

Descriptors: *Volumetric analysis, *Aqueous solutions, *Automation, Methodology, Monitoring, Flow rates, Sulfides, Ions, Automatic control, Chemical analysis, Pollutant identification.
Identifiers: *Ion selective electrodes, *Continuous monitoring, *Gradient titration, Reagents, Sulfied electrodes, Membrane electrodes, Accurary, Endpoint sensors.

A new approach to the automation of titration processes using ion-selective electrodes is described. Based on the gradient titration principle, the method involves the semicontinuous monitoring of a sample stream with a reagent stream where the concentration of the latter increases linearly in the form of a gradient. The flow rates of both sample and reagent streams are maintained constant, and a suitable ion-selective electrode monitors the approach to the equivalence point. The method is, in principle, the constant volume analog of conventional titrimetry. The results obtained for the determination of sulfide ion using mercuric nitrate as gradient reagent and a sulfide membrane electrode are presented. The initial study has shown that the gradient titration technique is experimentally feasible when an appropriate ion-selective electrode with a rapid response is available as the end-point sensor. No sophisticated potential measuring device is required; simple, inexpensive operational amplifier modules can be used for the potential readout. The procedure as described is not fully automatic, however, with part of the sample (and reagent titrant) handling step being done manually. Full automation, however, is possible by incorporating a modified Technicon Sampler into the system. (Holoman-Battelle)
W74-05303

INVESTIGATION OF THE FACTORS AFFECTING THE RESPONSE TIME OF A CALCIUM SELECTIVE LIQUID MEMBRANE ELECTRODE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
B. Fleet, T. H. Ryan, and M. J. D. Brand.
Analytical Chemistry, Vol 46, No 1, p 12-15, January 1974. 4 fig, 3 tab, 40 ref.

Descriptors: Effects, Calcium, Cations, Selectivity, Lead, Magnesium, Strontium, Zinc, Cadmium, Copper, Sodium, Hydrogen, *Electrodes.
Identifiers: *Liquid membrane electrodes, *Calcium electrodes, *Ionic interference, Response time, Data interpretation, Ion selective electrodes, Ion activity, Barium.

Measurements on the response time of a Calcium Selective Liquid Membrane Electrode are reported and a new parameter t sub 95 is proposed as being a more representative measure of electrode performance than the more widely used t sub 1/2. The former value is of more importance in assessing the performance of an electrode in real analytical situations. The effect of various interfering ionic species on the response time of the electrode is investigated and ions tested have been divided into three groups according to their effect on the response time. An interpretation of this division is proposed on the basis of the kinetics of the reaction of the interferent ion with the membrane site species and conventional selectivity ratios. It has been shown that a calcium liquid membrane electrode responds rapidly and reproducibly to step changes in calcium ion activity, with response time of the order of a few seconds. Also interfering ions can have a marked effect on the electrode response time and this cannot always be predicted from a knowledge of the selectivity constant. Where the selectivity constant is very small, it may be assumed that no effect on response time will be observed. For interfering ions with moderate to large selectivity constants, an increase in electrode response time will be observed when the kinetics of the interferent ion reactions become rate limiting. (Holoman-Battelle)
W74-05304

DETERMINATION OF TRACE AMOUNTS OF C2-C5 ACIDS IN AQUEOUS SOLUTIONS BY GAS CHROMATOGRAPHY,
Rome Univ. (Italy). Istituto di Chimica Analitica.
For primary bibliographic entry see Field 5A.
W74-05314

2L. Estuaries

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School o Forestry and Wildlife Management.
R. H. Chabreck, and A. W. Palmisano.
Ecology, Vol 54, No 5, p 1118-1123, Late Summe 1973. 1 fig, 3 tab, 18 ref.

Descriptors: *Hurricanes, *Freshwater marshe Aquatic plants, *Salt marshes, *Marine plant *Environmental effects, Soil chemistry, Wat chemistry, Mississippi River, Deltas, Water sam pling, Marsh plants, Coastal marshes, Water ana ysis, Soil analysis, Brackish water, Organ matter, Alligatorweed, Floating plants, Willo trees, Water hyacinth, Vegetation, Amphibiou plants, Rooted aquatic plants, Widgeon grass.
Identifiers: *Mississippi River Delta, Recover Macrophytes, Organic carbon, Phragmites com munis, Myriophyllum spicatum, Alternanthe philoxeroides, Lemna minor, Eichhornia cra sipes, Duckweed, Reed grass, Distichles spicat Scirpus robustus, Spartina patens, Salix nigr Balck willow, Bulrush, Species abundance, Vetc Aster, Water hyssop, Southern swamplilly, Wat pennywort, Common frog-fruit, Narrow-leav cattail, Great duckweed, Chicken spike, Smoo cordgrass, Big cordgrass, Saltmeadow cordgra Goldenrod.

The active delta of the Mississippi River was sa pled in August 1968 to determine plant speci composition, plant coverage, and soil and wat chemistry. Hurricane Camille struck this area August 1969, with winds in excess of 200 km/h a tides ranging upward to 5.2 m above MSL. T delta was resampled 2 weeks following the h ricane to evaluate the immediate effects on vege tion, soil, and water, and again 1 year after t hurricane to determine the recovery rate vegetation. The hurricane resulted in a dras reduction of vegetation. Regrowth was rapid in t delta marshes and after 1 year plant coverage a proached pre-hurricane levels of abundance; ho ever, recovery was slower in ponds and lakes. T loss of vegetation was mainly a result of sweeping action of wind and water, and pla were either uprooted or ripped apart and carr away by the current. Water salinity increased w the hurricane but declined by the following y and appeared to have only slight effect on ma vegetation. Plant species varied in their respo to the hurricane. Bacopa monnieri showed prac cally no effect, and Phragmites communis a Spartina alterniflora were reduced only slight Myriophyllum spicatum, Panicum repens, and ternanthera philoxeroides were greatly reduced the storm; and after 1 year, only Alternanth philoxeroides showed significant recove (Holoman-Battelle)
W74-04875

CURRENTS AROUND THE HAWAII ISLANDS. A STUDY OF COASTAL CURREN IN RESPECT TO SEWAGE DISPOSAL,
Hawaii Inst., of Geophysics, Honolulu.
For primary bibliographic entry see Field 5B.
W74-04925

CERC BULLETIN AND SUMMARY REPO OF RESEARCH PROGRESS FOR FISC YEARS 1965-66.
Army Coastal Engineering Research Cen Washington, D.C.
Vol II, 1965-66. 76 p.

Descriptors: *Coastal engineering, Cos Beaches, *Waves(Water), *Currents(Wat *Tides, *Storms, *Florida, *North Carolina, strumentation, Sampling, Sediments.
Identifiers: Longshore currents, Breakers, S zone, Sea sleds, Wave action, Nearsh processes.

his issue contains seven articles of interest to ose concerned with coastal, estuarine, and earshore processes. These are: Effect of Wave ction on Tidal Stages Along the Coast of Florida, larch 1962; Longshore Currents at Nags Head, orth Carolina; Study of Pilot Beaches in New ngland for the Improvement of Coastal Storm arning; The Sears Sea Sled for Surveying in the rf Zone; Heights of Waves Generated by a Flap-ype Wave Generator; Scuba Diving to In-estigate InSitu Behavior of Mobile Suspended-ediment Sampler; and Progress Reports on esearch Sponsored by the Coastal Engineering esearch Center. (See W74-04927 and W74-04928) inha - OEIS)
74-04926

FFECT OF WAVE ACTION ON TIDAL TAGES ALONG THE COAST OF FLORIDA, ARCH 1962,
rmy Engineer District, Jacksonville, Fla.
. Lazarus, and C. L. Nowlin.
: CERC Bulletin and Summary Report of esearch Progress for Fiscal Years 1965-66, Vol , p 1-10, 1965-66. 5 fig, 2 tab, 5 ref.

escriptors: *Florida, *Storms, Wind tides, Tidal ffects, *Atmospheric pressure, Energy, Vaves(Water), Coasts, Beaches.
entifiers: United States East Coast, Swells, ave action, Barometric pressure, Long-period aves.

he northeast storm of 5-9 March 1962 was one of e more severe storms which have battered the st coast of the United States in recent times. It used very severe damage from Long Island to e Outer Banks of North Carolina and significant mage from Maine to Florida. The entire Florida astline was affected by long-period swells, hough it was far from the center of the storm d the winds which generated them. Unusually gh tides which could not be attributed entirely to e effect of local winds were observed during this riod. Some instances are discussed of observed al behavior where the departures from pre-cted values are attributed to the effect of long-riod waves. Examination of tidal data from sta-ns distributed along the Florida coast during this orm incident shows a definite increase in tidal ge due to energy absorbed from wave action - ., wave effect - rather than wind set-up or rometric pressure. (See also W74-04926) (Sinha - EIS)
74-04927

ONGSHORE CURRENTS AT NAGS HEAD, ORTH CAROLINA,
rmy Coastal Engineering Research Center, ashington, D.C. Research Div.
J. Galvin, Jr., and R. P. Savage.
: CERC Bulletin and Summary Report of esearch Progress for Fiscal Years 1965-66, Vol p 11-29, 1965-66. 7 fig, 4 tab, 7 ref.

escriptors: *North Carolina, *Beaches, *Slopes, urrents(Water).
entifiers: Outer banks(NC), *Longshore cur-nts, *Breakers, Surf zone, Velocity measure-ent.

ngshore current velocity and associated wave d beach conditions were measured during 5 days March 1964, along a beach on the Outer Banks North Carolina. Velocity measurements, ob-ned by repeatedly timing the travel, over a 200-ot distance, of free-floating balloons filled with sh water, did not indicate a pulsating flow for e longshore current during the time of measure-nt and over the distance traveled by the floats. eaker angle, the variable most closely correlated th current velocity, was measured by Brunton mpass, by triangulation on a buoy at the breaker e, and by measurement of the velocities of the st and plunge point of the breaking wave. Wave ight and wave period were measured from wave gage records and by visual estimation. Beach slopes beneath the surf zone, measured from profiles supplied by the Louisiana State University field station at Nags Head, varied from 0.026 to 0.030. In four of the five sets of data obtained, the measured velocity (1.3 to 4.3 feet per second) differed by 0.1 and 1.0 foot per second from that predicted by two very different equations for longshore current velocity. (See also W74-04926) (Sinha - OEIS)
W74-04928

A REVIEW OF ESTUARINE MODELING,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
J. E. Overland.
In: Proceedings 18th Annual Technical Meeting, Institute of Environmental Sciences, May 1972. p 178-185 (1972). 2 fig, 2 tab, 21 ref.

Descriptors: *Simulation analysis, *Model studies, Equations, Friction, Turbulence, *Estuaries, *Water quality, Hydrodynamics, *Reviews, Path of pollutants.

Some of the current hydrodynamic and water quality estuarine models and the physical assumptions associated with them are reviewed. Technically, there is a distinction between modeling and simulating a physical system. Simulation implies correlating a large amount of data for a curve of best fit and to use this functional dependence for prognostication. Modeling implies starting from basic physical principles and deducing the behavior of more complex processes. Representation of estuaries is usually a combination of both techniques; one usually proceeds as far as possible on physical grounds, but finally fits the model to the prototype by judicious choice of unknown parameters in the equations, usually those associated with friction or turbulence. (Sinha - OEIS)
W74-04929

NEARSHORE PROCESSES,
Scripps Institution of Oceanography, La Jolla, Calif.
D. L. Inman.
In: Encyclopedia of Science and Technology. McGraw-Hill Book Company, Inc., 1971. 8 p, 8 fig, 10 ref.

Descriptors: *Coasts, *Beaches, *Waves(Water), Reviews, *Sediment transport, *Currents(Water).
Identifiers: Surf zone, *Nearshore processes, Circulation cells, Biological effects, Longshore currents, Beach cusps.

The establishment and persistence of natural sand beaches are often the result of a delicate balance among a number of factors, and any changes, natural or man-made, tend to upset the equilibrium. Explanations are given on waves, currents in the surf-zone, the formation of circulation cells, beach types, beach cycles, beach cusps, the mechanics of beach formation, longshore movement of sand, and the source of beach sediments. The rigor of wave action and the continually shifting substrate make the sand beach a unique biological environment. Since the beach-forming processes and the trapping of material by currents and sand are much the same everywhere, the animals found on sand beaches throughout the world are similar in aspects and habits. (Sinha-OEIS)
W74-04932

ON THE MEASUREMENT OF TURBULENCE IN ESTUARIES,
Connecticut Univ., Groton. Marine Sciences Inst.
For primary bibliographic entry see Field 5B.
W74-04933

SEDIMENTARY RESPONSE TO HYDROGRAPHY IN AN OREGON ESTUARY,
Oregon State Univ., Corvallis. Dept. of Oceanography.
L. D. Kulm, and J. V. Byrne.
Marine Geology, and Minneapolis were studied within an area whose natural groundwater flow is largely towards the center of the metropolitan area. This area coincides with the extent of the Hinckley Sandstone aquifer. Greater emphasis is placed on the area underlain by the Prairie du Chien-Jordan aquifer (about 2,000 square miles), from which approximately 75% of the groundwater for the metropo

W74-04934

SEA SURFACE TEMPERATURE AND SALINITY CONDITIONS IN 1969 AT AGATE BEACH AND YAQUINA BAY, OREGON,
Oregon State Univ., Corvallis. Dept. of Oceanography.
J. J. Gonor, and A. B. Thum.
Available from NTIS as AD-703 662 for $6.00 paper copy, $1.45 microfiche. Data Report No. 39, prepared for Office of Naval Research, Reference 70-1, February 1970. 24 p, 1 fig, 3 tab. N00014-67-A-0369-0001.

Descriptors: *Oregon, Coasts, *Temperature, *Salinity, *Upwelling, Tides, *Seasonal, *Estuaries.
Identifiers: Agate Beach(OR), Yaquina Bay(OR), Sea surface temperature.

Daily temperature and salinity conditions measured in the surf at Agate Beach, Oregon are summarized by 15 day periods for 1968 and 1969. For each period the number of observations, the high, the low, the mean and the standard deviation of the temperature and salinity measurements are tabulated. Daily data for 1969, derived from afternoon measurements are also given. A map indicating the stations is included, and the data are briefly discussed with the differences between the two years emphasized. The late occurrence of upwelling in 1969 accounts for the major differences between the two years. A water surface temperature station approximately 3 miles inside the mouth of Yaquina Bay was maintained in 1968 and 1969 by use of continuously recording thermographs. Daily data are given, starting in April, 1968, of surface temperature at higher high, lower low, lower high, and higher low waters. The influence of the state of the tide on bay temperatures, as well as that of other seasonal hydrographic phenomena are evident in the tabulations. (Sinha-OEIS)
W74-04935

NEAR-SURFACE OCEANIC DIFFUSION FROM A CONTINUOUS POINT SOURCE,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
R. L. Reinert.
In: Symposium on Diffusion in Oceans and Fresh Waters Lamond Geological Observatory, Palisades, New York, Aug/Sept 1964. T. Ichiye (editor), p 19-27, December 1965. 6 fig, 4 ref. Nonr 285(57).

Descriptors: Dyes, Tracers, *Diffusion, *Winds, *Waves(Water), *New York.
Identifiers: *Long Island Sound, Continuous point source.

Results and discussion of a dye experiment in Long Island Sound are presented. Special attention is paid to conditions that affect small scale diffusion. The experiment is performed during a time of constant tidal current and steady winds. Crossplume concentration data and aerial photographs are included. These data show interesting patterns thought to be due to the effects of wind and waves. (Sinha-OEIS)
W74-04937

DIFFUSION EXPERIMENTS IN COASTAL WATERS USING DYE TECHNIQUES,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
T. Ichiye.
In: Symposium on Diffusion in Oceans and Fresh Waters, Lamont Geological Observatory, Palisades, New York, Aug/Sept 1964. T. Ichiye (editor), p 54-67, December 1965. 4 fig, 18 ref. AEC-AT(30-1)2663, Nonr 266(48).

Descriptors: Dyes, Tracers, *Diffusion, Coasts, *New Jersey.
Identifiers: Shearing currents, Bahama Banks, Long Island, Langmuir circulation, Ekman spiral, *Wind current, *Drift current, *Eddy viscosity.

The data obtained from dye experiments off New Jersey coast, on the Bahama Banks and south of Long Island since 1961 are analyzed. The areas of a visually demarcated dye patch are determined from concentration measured with fluorometers and compared with the mean square separation of a two-particle theory of diffusion, yielding t(2) and t(3) law for small and large time t respectively. Elongation of dye patches is interpreted as vertically differential advection due to a shearing current. Striations are discussed as caused by helical vortices which may be also a cause of Langmuir circulation. The curvature of the tail part of a dye patch is attributed to the Ekman spiral in a pure wind current, because, in most cases, curved tails were observed for moderate winds and in waters deeper than 20 m and because the curvature is clockwise from head to tail in the northern hemisphere. A modified theory of a drift current with eddy viscosity decreasing exponentially with depth is developed and compared with patterns of dye patches. (Sinha-OEIS)
W74-04938

COASTAL CIRCULATION NEAR KAKINADA BAY DURING MONSOON PERIOD,
Andhra Univ., Waltair (India). Dept. of Meteorology and Oceanography.
R. Ramanadham, B. S. Reddy, and K. R. G. K. Murty.
Pure and Applied Geophysics, Vol 89, p 183-191, 1971. 6 fig, 1 tab, 3 ref.

Descriptors: Bays, Coasts, *Waves(Water), *Currents(Water), *Tides, *Monsoons, *Circulation, Sea breezes, Land breezes, Sand bars, Geomorphology.
Identifiers: *India(Kakinada Bay), Bay of Bengal.

An intensive study was made of currents in the coastal vicinity of Kakinada Bay and Godavari Point on the east coast of India. The circulation has high variability in both magnitude and direction related to the three current components namely wind currents, tidal currents and wave currents. The circulation pattern rapidly changes with the change in the phase of the tide and local winds of land and sea breeze. The littoral currents directed up-coast during premonsoon and monsoon seasons have insignificant effect across the bay opening due to the sheltering effect of the sand bar. The study is helpful for understanding the geomorphological changes of the shoreline in this region. (Sinha-OEIS)
W74-04941

A STUDY ON MIXING AND CIRCULATION IN THE ST. LAWRENCE ESTUARY UP TO 1964,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
H. J. A. Neu.
AOL Report 1970-9, December 1970. 31 p, 21 fig, 7 ref.

Descriptors: *Estuaries, *St. Lawrence River, *Mixing, *Circulation, Salinity, Temperature, Ice.

The salinity and temperature distributions in the St. Lawrence Estuary during fresh water inflows in Feb. and in May of 1963 are reported and analyzed. The mixing character of the Estuary varied from being well mixed at the head to moderately mixed in the section below the head to Tadoussac. In the deep section below the mouth of the Saguenay River, stratified conditions prevailed. The water was appreciably fresher on the south side of the channel than on the north side except off the mouth of the Saguenay River. Progressing seaward, the depth of the fresh upper layer decreased along the north shore and increased along the south shore. Temperatures in the surface layer during Feb. were higher on the north side than on the south. In May, this trend was reversed. The primary motion in the system is a longitudinal two-layer circulation in which the surface layer deviates toward the south shore and the deep layer toward the north shore. There is a net seaward flow of lower-salinity water on the south side and a compensatory flow of higher-salinity water on the north side. The Gaspe Current is a high-velocity surface stream that forms below Tadoussac and grows seaward with the entrainment of the water from the rivers of the north shore. Upwelling of the deep warmer water to the surface maintains a nearly ice-free channel along the north shore through most of the ice season. The intensity of the estuarine circulation in the St. Lawrence Estuary is determined primarily by the quantity of fresh water entering the system. (Sinha-OEIS)
W74-04944

CAUSE AND PREDICTION OF BEACH EROSION,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 2J.
W74-04945

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-04946

ESTUARY AND COASTLINE HYDRODYNAMICS.
Engineering Societies Monographs. McGraw-Hill Book Co., Inc., New York, 1966. 756 p. A. T. Ippen, editor.

Descriptors: *Estuaries, Coasts, *Hydrodynamics, *Beaches, *Shores, *Waves(Water), *Currents(Water), *Coastal engineering, Oceanography.

The fundamentals of water waves are logically and comprehensively developed to the point where practical problems become accessible to systematic interpretation by existing theory. The presentation is directed towards the needs of those working with coastal engineering problems. Limiting boundary conditions are emphasized while general mathematical developments are limited to those essential to understand the significance of the results. (See W74-04951 thru W74-04958) (Sinha-OEIS)
W74-04950

COASTAL PROCESSES,
California Univ., Berkeley. Dept. of Civil Engineering.
J. W. Johnson, and P. S. Eagleson.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc., Chap 9, p 404-492, 1966. 46 fig, 4 tab, 76 ref.

Descriptors: Coasts, *Beaches, Sediments, *Sediment transport, Beach erosion, Equilibrium, *Coastal structures, *Ocean currents, *Tidal effects, Wind, Rip currents, Profiles, Particle size, *Harbors, *Littoral, Breakwaters, Shore protection, Reviews.
Identifiers: Nearshore processes, Tidal currents, Longshore currents, Wave induced currents, Breaking waves, Sand by passing.

A review is presented of the state of knowledge of coastal processes. The review is presented under the following headings: sources and characteristics of beach material; modes of transport and losses of material; quantitative analysis of transport processes; characteristics of beach deposits; characteristics of the equilibrium beach; and sediment problems at coastal structures. (See also W74-04950) (Sinha - OEIS)
W74-04951

TIDAL DYNAMICS IN ESTUARIES. PART ESTUARIES OF RECTANGULAR SECTION,
Massachusetts Inst. of Tech., Cambridge. Dept. Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 10, Part 1, p 493-522, 1966. fig, 2 tab, 22 ref.

Descriptors: *Friction, *Sedimentation, Diffusion, *Tidal effects, *Estuaries, Coasts, Reviews.
Identifiers: *Cooscillating tides.

This review is limited to the development of understanding of those processes of tidal flows estuaries which are of primary importance in dealing with diffusion and sedimentation problems. The subject is reviewed under the following headings: general review of engineering problems in tidal estuaries; general characteristics of estuaries; mathematic description of tides without friction and tides with friction; and experimental results on cooscillating tides. (See also W74-04950) (Sinha - OEIS)
W74-04952

TIDAL DYNAMICS IN ESTUARIES. PART REAL ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. Civil Engineering.
D. R. F. Harleman.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 10, Part 2, p 522-545, 1966. fig, 3 tab, 19 ref.

Descriptors: *Estuaries, *Friction, *Tidal effects, *Equations of motion, Coasts, Reviews.
Identifiers: Tidal wave propagation, *Cooscillating tides, *Harmonic analysis.

Analysis of tidal motion in real estuaries necessarily involves a degree of approximation, since it is never possible to specify boundary conditions in exact analytical expressions. For relatively narrow estuaries it is generally permissible to neglect the effect of the earth's rotation; however, it is rarely possible to ignore the effect of friction on the wave propagation in real estuaries. The subjects reviewed are physical concepts of tidal motion in estuaries; methods of analysis; numerical integration methods; harmonic method; damped cooscillating tide; and Delaware Estuary. (See also W74-04950) (Sinha - OEIS)
W74-04953

SALINITY INTRUSION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 13, p 598-629, 1966. 12 fig, tab, 18 ref.

Descriptors: *Estuaries, *Salinity, *Tidal effects, Gravity, Fresh water, Mixing, Diffusion, *Coasts.
Identifiers: *Salinity intrusion, *Tidal prism.

The flow regime in estuaries is governed by four distinct dynamic influences, which determine the direction and magnitude of velocities at different elevations and at different distances from the mouth. The primary dynamic factors listed in order of their importance for the flow are as follows: (a) the effect of the tide throughout the salinity intrusion length as a function of the forcing tide at the entrance; (b) the effect of gravitational forces due to density variations between fresh water from upland sources and saline water entering from the sea; (c) the gravitational forces needed to produce a net seaward transport of fresh water; and (d) the Coriolis forces and centrifugal forces inducing transverse fluid motion due to rotation of the earth and due to the curvature of the estuary channel, respectively. (See also W74-04950) (Sinha - OEIS)
W74-04954

SEDIMENTATION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics, Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 15, p 648-672, 1966. 6 fig, 1 tab, 22 ref.

Descriptors: *Estuaries, *Sedimentation, *Sediment transport, *Diffusion, Shoals, Sediment load, Flocculation, Sands, Mud - water interface, Hydraulic transportation, Flow.

Following a review of the state of knowledge of factors related to estuarine sedimentation, summaries are presented of the properties of estuarine sediments; the interaction of sediment and water flow; and diffusion characteristics and sedimentation in real estuaries. Specific aspects considered are: general flow phenomena; bed load and its source; properties and sources of mud; shoaling; flocculation; transport of granular sediments; flow of water-mud mixtures; differences in hydraulic transport between granular and flocculating materials; and consequences of human activities. (See also W74-04950) (Sinha - OEIS)
W74-04955

FIELD EXPERIENCE IN ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 16, p 673-690, 1966.

Descriptors: *Estuaries, *Sediment transport, Dredging, Navigation channels, Tidal effects, Salinity, *Mixing, *Sedimentation, *Coasts, *Currents(Water).
Identifiers: Shoaling, *Tidal currents.

This review of field experience in estuaries discusses: tidal currents, their origin, effects of tidal range, effects of diurnal inequality in tides, and phase relationships between tide and currents; salinity generated currents; estuary mixing types; sedimentation in estuaries; sedimentation in navigation slips; and dredging and spoiling practices in estuaries. (See also W74-04950) (Sinha - OEIS)
W74-04956

MODEL LAWS FOR COASTAL AND ESTUARINE MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. H. Keulegan.
In: Estuary and Coastline Hydrodynamics, Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 17, p 691-710, 1966. 11 ref.

Descriptors: *Estuaries, *Mixing, *Model studies, Density, Dimensional analysis, *Salinity, *Rivers, Flow, *Diffusion.
Identifiers: Similarity.

Model laws for coastal and estuarine models are reviewed. Subjects discussed are: dynamical approach to similarity; dimensional analysis for density flow; method of differential equations; necessity of distortion; models of unsalinated rivers; models of mixed estuaries; and mixed approaches to models. (See also W74-04950) (Sinha - OEIS)
W74-04957

TIDAL AND SALINITY MODEL PRACTICE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 18, p 711-731, 1966. 12 fig.

Descriptors: *Estuaries, *Model studies, *Tides, *Salinity, Diffusion, Hurricanes, Storms, New Jersey, South Carolina, Louisiana, Texas, Rhode Island.
Identifiers: Absecon Inlet(NJ), Charleston Harbor(SC), Vermilion Bay(LA), Delaware Estuary, Matagorda Bay(TX), Narrogansett Bay(RI), *Salt water intrusion, Flushing.

What estuary models are like and what they can and cannot contribute to the solution of estuarine problemsis discussed, rather than the technical aspects of model construction, instrumentation, and operation. The hydraulic estuary model is an engineering and scientific tool which, in the hands of those well versed in its use and in the interpretation of model test data, can contribute greatly to the solution of complex problems. The hydraulic estuary model should not be looked upon as a substitute for field and analytical studies but rather as an aid in such studies by contributing information which cannot be obtained accurately by other means. As demonstrated by specific examples, hydraulic models of estuaries are extremely useful tools in studies leading to a more complete understanding of estuarine phenomena, as well as for predicting the effects of proposed physical and other changes in estuaries on the hydraulic, salinity, shoaling, and flushing characteristics of these complex systems. However, such model studies must still be classified as art rather than science, and for this reason estuary models should be entrusted to those who have experience in the field and are thoroughly familiar with the uses and limitations of the models involved. (See also W74-04950) (Sinha - OEIS)
W74-04958

CNOIDAL WAVES IN SHALLOW WATER,
Texas Univ., Austin. Dept. of Civil Engineering.
F. D. Masch.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 1, p 1-22, 1964. 7 fig, 25 ref.

Descriptors: *Shallow water, *Waves(Water), Energy.
Identifiers: *Cnoidal waves, *Wave transformations, Shoaling, Power transmission, Long waves.

The propagation of long waves of finite amplitude in water with depth to wavelength ratios less than about one-tenth and greater than about one-fiftieth can be described by cnoidal wave theory. To date little use has been made of the theory because of the difficulties involved in practical application. The theory necessary for predicting the transforming characteristics of long waves based on cnoidal theory is presented. Basically the method involves calculating the power transmission for a wave train in shallow water from cnoidal theory and equating this to the deep water power transmission assuming no reflections or loss of energy as the waves move into shoaling water. The equations for wave power have been programmed for the range of cnoidal waves, and the results are plotted in non-dimensional form. (Sinha - OEIS)
W74-04959

THE COASTLINE OF RIVER-DELTAS,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
W. T. J. N. P. Bakker, and T. Edelman.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 13, p 199-218, 1964. 10 fig, 1 tab, 4 ref.

Descriptors: Coasts, Mathematics, *Waves(Water), *Rivers, *Deltas, *Sediment transport, *Shallow water.
Identifiers: Coastal configuration.

The purpose is to investigate the shape of the coastline of a river delta on a coast, along which sediment is transported by waves only. In order to make the problem suitable to a mathematical treatment it is necessary to simplify to a large extent the processes occurring in nature. Instability along the circular part of the delta (all other parts are always stable) probably means, that 'spits' occur. The shape of spits is not dealt with. If the quantity of river sediment exceeds a certain amount, the delta becomes partly unstable and erosion on the lee side of the delta begins; the delta grows so large, that is acting as a partly circular 'groin' with erosion on its lee side and accretion on the weather side. (Sinha - OEIS)
W74-04961

THEORETICAL FORMS OF SHORELINES,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
W. Grijm.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers. Chap 14, p 219-235, 1964. 13 fig.

Descriptors: *Shores, *Waves(Water), Bays, Coasts, *Sediment transport.
Identifiers: *Shoreline configuration, Littoral transport, Capes, Cusps, *Wave action, Nearshore.

Theoretical studies suggest that maximum littoral transport takes place when waves approach shore obliquely. Discussed is the question of the type of shoreline to be expected when the littoral transport is ruled by the function sin 2 alpha when alpha equals 45 degrees and alpha represents the angle between the wave front and the shoreline. Shoreline configuration is theoretically expected to vary as the angle of approach varies. Correspondence between configuration and angle of approach is illustrated. When littoral transport is at a maximum cusp formation takes place. (Sinha - OEIS)
W74-04962

QUASI-WEEKLY AND DAILY PROFILE CHANGES ON A DISTINCTIVE SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
J. D. Rohrbough, J. E. Koehr, and W. C. Thompson.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 16, p 249-258, 1964. 4 fig, 9 ref.

Descriptors: *California, *Beaches, *Refraction(Water waves), Profiles, *Sediment transport, Intertidal areas, *Bays, Coasts, *Shallow water.
Identifiers: *Monterey Bay(Calif), Nearshore processes, Onshore-offshore transport, Daily variations.

Del Monte Beach, because of its sheltered location in Monterey Bay, California, provides a natural laboratory for the study of beach profile changes and other nearshore phenomena by virtue of the relative simplicity of the natural conditions that prevail there. Extreme wave refraction results in a prevalence of swell of low height and breaker angle, but having a wide range of period. Coastal currents, tidal currents, and meteorological tides are negligible. There is no significant net littoral drift, accordingly, changes in the beach profile appear to involve only onshore-offshore transport of sand grains. A breaker-height gradient occurs along the beach, so that two beach profiles were established. Gradients also occur along the beach in sand texture, beach slope, and beach curvature. The two profiles, restricted to the intertidal zone, were measured quasi-weekly and then daily over a period of nine months. The changes in sand level at both were quite similar in magnitude in spite of the wave height gradient along the beach. No clear-cut seasonal cycle and no fortnightly spring-neap tidal cycle was detected in the data. The concurrent nature of the daily variations of both sand level and waves recorded immediately off the beach leave no doubt that changing wave conditions were the primary cause of the changes observed in Del Monte Beach, even though no clear-cut relationship between the two factors was apparent. (Sinha - OEIS)
W74-04964

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
T. Ito, M. Hino, J. Watanabe, and K. Hino.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 43, p 686-712, 1964. 15 fig, 9 ref.

Descriptors: Hurricanes, *Typhoons, *Storm surges, *Dikes, *Tides, *Forecasting, *Bays, Coasts, Equations, Winds, Coastal structures.
Identifiers: *Japan(Tokyo Bay), Prediction.

Mathematical problems on the numerical calculation of storm surges are discussed. The partial differential equations of motion adopted take into account the Coriolis force and the non-linear terms such as the inertial terms and a quadratic form of bottom friction. As a result, special care must be taken in order to obtain stable forms of finite-difference equations. Inadequate forms accumulate errors to cause divergence of the step by step calculations. A set of stable forms of the finite-difference equations of motion and continuity has been derived. Japan coasts are frequently damaged by severe storm surges (Typhoon Tides). To protect the metropolitan area from storm surges, a proposal has been made to construct a dike across Tokyo Bay. A numerical calculation has been made by means of IBM 7090 to estimate for several opening widths of the proposed dike, its effects on the reduction of surges. Interactions between daily tides (astronomical tide) and surges are also discussed. (Sinha-OEIS)
W74-04971

POTENTIALS OF TIDAL POWER ON THE NORTH ATLANTIC COAST IN CANADA AND UNITED STATES,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
J. T. Laba.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 49, p 832-857, 1964. 10 fig, 5 tab, 2 ref.

Descriptors: Canada, United States, Tides, *Powerplants, *Bays, Coasts, *Tidal powerplants, Tidal energy, Maine, *International waters.
Identifiers: *Power sources, Passamaquoddy Bay, New Brunswick(Canada), Shepody Bay, Cobscook Bay(ME).

The most suitable locations for erection of tidal power plants on the North Atlantic Coast are reviewed and classified in respect to the possible pool arrangement. The harnessing of the tides to produce power in various layouts is described. The output from two proposed tidal power projects, Passamaquoddy Bay and Shepody Bay are compared and some auxiliary power sources to supplement the varying output of tidal power are discussed. The tide producing forces and the effect of the coastline on the tide height is also briefly described. (Sinha-OEIS)
W74-04972

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN NON-STRATIFIED TWO-DIMENSIONAL ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
J. N. Nielsen, and G. D. Kuhn.
Available from the National Technical Information Service as PB-228 852, $9.25 in paper copy, $1.45 in microfiche. Technical Report NEAR TR 45, (1973). 117 p, 17 fig, 3 tab, 17 ref, 1 append. OWRR C-3189(No 3698) (1). 14-31-0001-3698.

Descriptors: *Estuaries, *Dispersion, *Turbulent boundary layers, Mixing, Stratification, Flow, *Water pollution sources, Momentum equation, Fluid friction, Open channel flow, Convection, *Diffusion, *Path of pollutants.

An analytical formula representing the law of the wall and the law of the wake of turbulent boundary-layer theory has been found to represent the vertical velocity profiles of both laboratory channels and field data from real estuaries. The formula is used in an integral boundary-layer calculation method to calculate the detailed time-dependent flow field of two-dimensional estuaries. For given tidal information, only the integrated continuity and momentum equations are necessary to calculate the two parameters of the formula. The unique solution is found to pass through one or more singular points between the ends of the estuary. An analytical expression for the concentration profile is derived based on an analogy between turbulent exchange of momentum and mass. Good comparisons between theory and experiment were obtained for the flow field of a laboratory flume. Examination of data for dispersion indicates that the dominant terms of the governing equations are not diffusive in nature but are convective.
W74-04983

STATUS OF STATE COASTAL ZONE MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administration, Washington, D.C. Coastal Zone Management Task Force.
Preprint. May, 1973. 62p.

Descriptors: *Coasts, *State governments, Planning, Administration, *Regulation, *Legislation, *Management, Mapping.
Identifiers: *Coastal zone management.

A series of resumes is presented, each of which briefly summarize the present (1973) status of activities in the coastal zone by individual state governments. Information was compiled on (1) administrative structures set up to focus state efforts on coastal zonal problems; (2) legislation, executive orders, and resolutions dealing with coastal activities; and (3) research, inventory, mapping, and management efforts. (Hoffman-North Carolina)
W74-04995

LONGSHORE CURRENTS AND SEDIMENT MOTION IN THE COASTAL ZONE OF THE SEA OF AZOV,
Rostov-on-Don State Univ. (USSR).
V. A. Mamykina.
Fluid Mechanics--Soviet Research, Vol 2, No 5, p 166-170, September-October 1973. 2 fig, 3 ref. (Originally published in Gidromekhanika, No 18, p 42-46, 1972.)

Descriptors: *Currents(Water), *Sediment transport, *Deposition(Sediments), *Coasts, Shores, Sand spits, Sand bars, Waves(Water), Water circulation, Movement, Velocity, Winds, Slopes.
Identifiers: *USSR(Sea of Azov), *Longshore currents.

Longshore currents near Belosarayskaya sandspit on the northern shore of the Sea of Azov were investigated in July-August 1966-67 for their effects on sediment transport. Currents in the intermediate layer are most stable and depend little on changes in wind and bottom relief. Bottom-layer currents play an important role in erosion and sediment deposition in the coastal zone. Currents in the Belosarayskaya Bay are characterized by their low velocity--2 to 5 cm/sec. The tip of the bar (1 m from the surface, 2 m station depth, and 500 m from the water edge) is characterized by an extremely complex circulation. Sediment deposition results in the formation of underwater extensions of the bar which in time reach the surface. Prevailing bottom current velocity along the seacoast of the bar is 6-8 cm/sec at a distance of 300-500 m and 8-11 cm/sec at 1,000 m from shore, corresponding to wind speeds of 3-4 m/sec. With wind speeds of m/sec or more, a current velocity of 17-20 cm/sec was observed. Maximum bottom current velocities of 30-32 cm/sec were noted after 8-12 m/sec storm squalls. Bottom deposits on the underwater slope of the Belosaraysk bar are composed of fine grained sand (80%), whose movement begins with velocities of 8-11 cm/sec. At current velocities of 15-20 cm/sec, corresponding to yearly average wind speeds of 5 m/sec above the Sea of Azov, the transported material includes silt particles and fine- and medium-grade sand. Bottom velocities of 30-40 cm/sec suffice for transport of sediment of all fractions found on the coast and bottom of the Sea of Azov. (Josefson-USGS)
W74-05024

VARIATIONS IN THE HEIGHT OF WAVE RUN-UP ON A SANDY BEACH,
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
E. S. Tsaits, and V. V. Khomitskiy.
Fluid Mechanics--Soviet Research, Vol 2, No 5, p 152-156, September-October 1973. 2 fig, 2 tab, 3 ref. (Originally published in Gidromekhanika, No 18, p 31-35, 1971).

Descriptors: *Waves(Water), *Beaches, *Sand, Height, *Variability, Wavelengths, Slopes, Measurement, Equations.
Identifiers: *USSR(Crimea), *Wave runup.

Measurements were made of wave runup height on the western part of the Crimea on a beach composed of medium- to coarse-grained sand containing rolled shell fragments. A stretch of straight beach was selected as the observation site. Periodic measurements and leveling operations were performed during calm periods on each leveling line to assess the state of the coastal slope and beach between storms. Pickups of the marine wave gage (GM-16) were fastened to piles and connected via cables to the EPP-09 potentiometer to measure wind-wave height at various points along the underwater slope. The first recording of waves approaching from the sea was made at a depth of 7-8 m, 350-400 m from shore; the second was made at a depth of 4-5 m, 200-250 m from shore. The height of wave runup was fixed visually from reading on a decimeter tape laid out on the surface of the beach for each of the 100-150 waves and recorded in a logbook. A total of 17 storm sections were processed. Wave height of 1% expectation was 0.35-1.8 m; average wavelength was 10-41 m and the angle of approach was 4-65 deg. The coefficient of variation of wave runup height ranged from 0.18 to 0.4. Formulas are given for estimation of wave height on flat slopes. (Josefson-USGS)

74-05025

OVEMENT OF WATER ALONG THE SHORE ND NORMAL TO IT IN THE NEAR-SHORE ONE OF A SHALLOW-WATER COAST,
kademiya Nauk SSSR, Kaliningrad. Institut keanologii.
I. Filimonov.
eanology, Vol 6, No 4, p 530-534, 1966. Trans. om Okeanologiya, Vol. 5, No. 3, 1965. 1 fig, 3 o, 5 ref.

escriptors: *Currents(Water), Topography, ediment transport, *Shallow water, Coasts, torms, *Winds, Beaches, Slopes.
entifiers: *Longshore currents, Nearshore ocesses, *Water transport asymmetry.

om an evaluation of experimental studies of rm-generated movements of water made with cording current meters, it has been possible to ce the distribution of near-bottom velocities in longshore movement on the profile of the sub- rine beach slope and to consider movements rallel to and normal to the shore in their interac- n. The stretch of coast examined in 1963 had o submarine ridges, whereas in the summer of 52 there were three ridges on the same stretch. is indicates considerable reconstruction of the ofile of the submarine beach slope. Alternating ovements of water normal to the shore take ce against a background of prevailing longshore w. The amount of water transported by the gshore flow is 60-80% of the discharge through ection perpendicular to the total current vector, d the magnitude of this transport is related to the nd direction relative to the shoreline. There is a rly marked asymmetry of water discharge in the ttom longshore flow. The return flow ranges tween 1 and 17%. The asymmetry of water nsport is less pronounced in bottom flow to the ore, and the ratio may be unity. (Sinha-OEIS)
74-05028

OMPOSITE ENERGY FLUXES AS FACTORS COASTAL FORMATION,
titute of Biology of the Southern Seas, vastopol (USSR).
A. Pravotorov.
eanology, Vol 5, No 3, p 66-68, May 1966. 12 . Trans. from Okeanologiya, Vol. 5, Nol 3, 1965.

scriptors: *Waves(Water), *Currents(Water), ores, Winds, Meteorology, Hydrology, Topog- hy, *Eddies, *Storms, *Energy, *Shallow ter.
ntifiers: Beach cusps, Scalloping, Bottom ography, Nearshore processes, *Longshore rents.

number of phenomena taking place in the rshore zone are not satisfactorily explained ely in terms of wave processes and the currents ociated with them, or in terms of the currents ompanying surges. Among these phenomena the wave-associated 'rhythmic' medium scale mations. Beach cusps are evidently another for- tion whose 'rhythmic' inception is not readily plainable by the effect of the energy flux of ves alone. The 'rhythmic' windings of the baths in a zone of ridges on the submarine slope accumulation features in the form of rmonics' of various scales is reminiscent of ilar phenomena occurring below water. Scal- ing is also a feature of hydrological fronts in the sence of wind, whereas waves approaching the nt are greatly attenuated, and at the front break are destroyed. Many phenomena observed in nearshore zone are not solely due to wave ac- n. The formation of sand ridges and ridges of ae at an angle to the coast is reminiscent of the ion of Langmuir eddies generated by the wind , it must be supposed, interacting with the ves as they are destroyed on approaching the re. When eddies which have developed over p water areas during an intense storm enter shallower water they begin to affect the sea floor. Smaller eddies induced by the larger eddies and maintained by wind energy continue to advance towards the shore until they are completely destroyed in interaction with the bottom and with the waves; this affects the material-moving capacity of the waves and is reflected in coastal dynamics. (Sinha-OEIS)
W74-05029

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 2J.
W74-05031

HYDROGRAPHIC ATLAS OF NORTH CAROLINA ESTUARINE AND SOUND WATERS, 1972,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 2J.
W74-05032

NONLINEAR DEVELOPMENT OF THE RAYLEIGH-TAYLOR INSTABILITY IN THE 'SHALLOW-WATER' APPROXIMATION,
Naval Research Lab., Washington, D.C.
D. L. Book, E. Ott, and A. L. Sulton.
Available from NTIS as AD-768 296, $2.75 in paper copy. NRL Memorandum Report 2642, September 1973. 17 p, 4 fig, 12 ref.

Descriptors: *Shallow water, Gravity, *Interfaces, Fluid mechanics, Dynamics.
Identifiers: Riabouchinsky formulation, Gas-dynamic analogy, Rayleigh-Taylor instability, Fluid layers.

The nonlinear evolution of the Rayleigh-Taylor instability in the long wavelength limit is investigated for an incompressible fluid supported against gravity (or inertial forces) by a massless fluid and bounded above by a rigid wall. In plane geometry, the equations are identical with those of shallow water theory, but with the sign of the gravitational acceleration reversed. They are rewritten in the Riabouchinsky (gas-dynamic analogy) formulation and solved numerically. The shallow water approximation permits a solution for the motion of the interface without reference to the detailed motion of fluid in the interior. There is a range of parameters in which the nonlinear development of the Rayleigh-Taylor instability in an ideal fluid can be simply described in terms of the motion of the interface, that is, essentially one-dimensionally. The resulting equations have been solved numerically to yield a universal functional form of this motion. The time over which this solution can be expected to hold depends on the parameters with which it is scaled. The solution found here is only valid until vertical displacements become of the order of the wavelength. Thereafter the flow is essentially two-dimensional and the shallow water description is not applicable. The results given will be useful in liner stability analyses, however, if the fastest growing wavelength observed experimentally is of the order of or larger than the the minimum radius the liner is designed to reach, or if the growth rates are such that the 'dwell time' of the liner is comparable to that required to reach the breakdown point of the model. (Sinha - OEIS)
W74-05034

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
For primary bibliographic entry see Field 5B.
W74-05038

WAVE PROPAGATION IN CONTINUOUS RANDOM MEDIA,
California Univ., Los Angeles. Dept. of Mathematics.
For primary bibliographic entry see Field 2J.
W74-05041

EXISTING AERIAL PHOTOGRAPHIC RESOURCES OF COASTAL GEORGIA AND A BRIEF LISTING OF INTERPRETATIVE AIDS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 2J.
W74-05042

NUTRIENT STUDIES IN HYPERFERTILIZED ESTUARINE ECOSYSTEMS. I. PHOSPHORUS STUDIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 5C.
W74-05061

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS.
Seattle Univ., Wash. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-05114

THE HYDROGRAPHY OF THE BROADKILL RIVER ESTUARY, DELAWARE,
Delaware Univ., Newark. Dept. of Biological Sciences.
P. Dewitt, and F. C. Daiber.
Chesapeake Science, Vol 14, No 1, p 28-40, March 1973. 9 fig, 1 tab, 13 ref. OWRR A-006-DEL(4).

Descriptors: *Estuaries, *Delaware, *Water circulation, Water quality, Water pollution, Saline water intrusion, Dissolved oxygen, Tides, Turbidity, Mixing, Hydrography.
Identifiers: *Broadkill River(Del).

The hydrography of the Broadkill River, a narrow, shallow estuary in southeastern Delaware, was studied from July 1966 through February 1971. Measurements of current velocity, tide stage, salinity, water temperature, dissolved oxygen, pH, and turbidity were made at several stations along the course of the estuary. The Broadkill River has characteristics of both a partially-mixed and well-mixed estuary. During normal runoff the system discharges 130,000 cu m of freshwater per tidal cycle. The flushing time of the entire system increases from 10.3 tidal cycles during high runoff to 24.2 tidal cycles during low runoff. The lower estuary, the most seaward 25% of the system, is sectionally homogeneous during 90% of each tidal cycle. Homogeneity is maintained by strong tidal currents. The flushing time of the lower estuary is relatively constant and increases from 0.6 to 0.9 tidal cycle with decreasing freshwater runoff. The tidal river, the farthest upstream 40% of the system, is rarely invaded by saline water from the upper estuary. This section is polluted through the discharge of organic wastes into the river at a point 0.5 km downstream from the river's source. Downstream from the source of pollution, anoxic conditions are present from spring through autumn and are relieved only during the coldest months of the winter. (Knapp-USGS)
W74-05122

ON THE POSITION OF TIDAL BARRIERS IN NORTHUMBERLAND STRAIT,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2E.
W74-05140

RHODE ISLAND'S BARRIER BEACHES: VOLUME I, A REPORT ON A MANAGEMENT

PROBLEM AND AN EVALUATION OF OPTIONS,
Rhode Island Univ., Kingston. Coastal Resources Center.
S. B. Olsen, and M. J. Grant.
Marine Technical Report No 4, 1973. 118 p, 3 fig, 19 ref, 3 append.

Descriptors: *Barrier islands, *Beaches, *Water resources development, *Rhode Island, Management, Reviews, Evaluation, Recreation facilities, Erosion control, Beach erosion, Hurricanes, Shore protection, Ocean waves, Environmental effects, Marshes, Ecology, Social aspects.
Identifiers: *Barrier beaches.

Information is summarized and evaluated on management problems of the barrier beaches along Rhode Island's ocean coast. A barrier beach is a narrow strip of land made of unconsolidated material that extends roughly parallel to the general coastal trend and is separated from the mainland by a relatively narrow body of water. In the great majority of cases Rhode Island barriers are the seaward boundaries of coastal ponds, many of which are salt or brackish. The barriers have been formed by longshore currents and waves that have deposited sediments, chiefly sand and pebbles, across shallow embayments. The barriers are low in profile and are highly vulnerable to hurricane damage. (Woodard-USGS)
W74-05152

PHOSPHATES IN SEDIMENTS OF PAMLICO ESTUARY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W74-05296

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05328

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W74-05332

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
D. Chapman.
American Journal of Agricultural Economics, Vol 55, No 3, p 433-440, August 1973. 6 tab, 24 ref, 1 append.

Descriptors: *Financial feasibility, *Cost-benefit analysis, *Irrigation programs, *Desalination, *National income, *Investment, Operating cost, Governments, Systems analysis, Optimization.
Identifiers: *Agro-industrial projects, *Social benefits, *United Arab Republic(El-Hamman-Egypt).

In recent years, the possibility of desalting sea water to produce irrigation water for large-scale commercial agriculture and industry has been considered as a means of stimulating cooperation and economic development in the Middle East. This study investigates the financial feasibility and the social benefits and costs of nuclear desalination agro-industrial projects. Financial feasibility and national income benefit analyses are performed. The financial analysis determines project investment and operating costs, revenues, cash flows, and profitability with likely market prices and government policies. The benefit-cost analysis examines the effect of the project on macro-economic goals such as employment, foreign trade, capital scarcity, and national income. The project site is El-Hamman, 30 miles west of Alexandria and chosen because of its soil characteristics, present unsettles status, and nearness to market and port facilities. Project design was carried out in three simultaneous phases: selection of agricultural and livstock commodities for maximum profit from use of project water; examination for maximum profit of industries having electric-intensive production processes; and engineering examination of 500-megawatt electric power plants operated in association with desalination plants to determine least costly methods of production. As presently designed, such a complex appears to require deficit financing, provide little employment, retard national income growth compared to other investment opportunities, and increase the foreign exchange deficit. (Bell-Cornell)
W74-05382

3B. Water Yield Improvement

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6D.
W74-04915

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-04922

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-04992

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
For primary bibliographic entry see Field 4B.
W74-05168

WHEAT PRODUCTION PROBLEMS AND POTENTIALS ON DRYLANDS,
Wheat Research and Training Center, Ankara (Turkey).
For primary bibliographic entry see Field 3F.
W74-05221

3C. Use Of Water Of Impaired Quality

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-04976

EXPERIMENT IN RAPID LEACHING O SALINE SOILS IN THE GOLODNAYA STEPP (OPYT USKORENNOY PROMYVKI ZASOLEN NYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institu Gidrotekhniki i Melioratsii, Moscow (USSR).
A. A. Sid'ko, S. I. Myasishchev, V. P. Bayakina, and V. A. Sveshnikov.
Pochvovedeniye, No 12, p 133-137, 1972. 4 tab.

Descriptors: *Land reclamation, *Drainage pra tices, *Leaching, *Saline soils, *Drains, Salt Water balance, Evaporation, Permeability, Rice.
Identifiers: *USSR(Golodnaya Steppe).

Experiments in rice paddies showed that strong saline soils can be desalinized in a single season using deep permanent drains and closely spac shallow temporary drains. Investigations we conducted on Meadow-Sierozem soil in the Golo naya Steppe where total toxic salt content of t soil ranged from 0.5% in the upper layer of t zone of aeration to 2.5% in the lower layer, a permeability in these layers ranged from 0. m/day to 0.03 m/day, respectively. Deep p manent drains spaced 330 m apart and shall temporary drains spaced 20 m apart desaliniz the soil to a depth of 120-130 cm within 72 da using 5,000 cu m of water/ha and to a depth of cm within 112 days using 8,300 cu m of water/ Under the same conditions but with more frequ application of deep drains during this time, the was desalinized to a depth of 4.5 m. (Josefs USGS)
W74-05018

POSSIBILITIES OF SUPPLY AND PROPER U OF WATER IN THE GARMSAR AREA,
Ministry of Water and Power, Tehran (Ir Research Div.
B. Yazdani.
In: Agricultural Aspects of Arid and Semi-a Zones, CENTRO seminar, 1972, p 212-224. 12 t

Descriptors: *Irrigation, *Dry farmi *Agriculture, Arid lands, Cereal crops, Soils, rigation systems, Irrigation canals, Irrigat design, Irrigation programs, Irrigation we Groundwater, Groundwater recharge, Grou water resources, Water resources, Wa resources development, Water supply devel ment.
Identifiers: *Iran(Garmsar area).

The garmsar area of Iran is an arid zone of appr imately 50,000 hectares on the edge of the g salt desert of central Iran. A very dry clim prevails in the area, offering insufficient wate irrigate all the arable lands. High temperatures soil-drying winds characterize the climate. Hablehrud River and its tributaries are the p cipal source of agricultural water in the region an annual flow of 247.7 mcm. which is fairly sa Groundwater extraction offers only an additi 35 mcm. of similarly saline water. These w quality conditions contribute to the cause of salty and calciferous soil of the region. Curre rigation development includes a canal syste about 920 km total which diverts the flow of Hablehrud. This system irrigates barley and w primarily, but some cotton is also cultivated. regional development plan includes increased of groundwater, saline soil reclamation, additi surface water development and recharge aug tation. These steps are expected to greatly prove the agricultural productivity of Garm (Muller-Arizona)
W74-05217

GENERAL REPORT ON DEVELOPMENT UTILIZATION OF SALINE SOILS IN IRAN,
Jondi Shahpour Univ., Ahvaz (Iran).
A. Ghobadian, and H. Siadat.
In: Agricultural Aspects of Arid and Semi Zones, CENTRO seminar, 1972. p 248-257. 1

escriptors: *Dry farming, *Agriculture, *Saline ils, *Soil chemistry, Salinity, Chemical proper-s, Geochemistry, Geology, Leachate, Soil emical properties, Soil environment, Soil anagement, Saline water, Saline water systems, il-water-plant relationships, Land, Arable land. entifiers: *Iran.

er 90 percent of Iran receives less than 500 mm precipitation annually. Peculiarities in omorphology and land degradation have led to development of saline soils in the region. The tural processes of salinization of soils are cussed, including geology and geochemical fac-s, wind effects, geomorphology, biological fac-s, and surface water effects. The high salinity surface waters is determined to be a significant tor in soil salination during periods of extensive nual flooding. Manmade or secondary saliniza-n is also found to be a significant factor, usually ing the form of irrigation and soil mismanage-nt. A decrement in groundwater quality is also ed. The application of saline groundwater in ir-ation enhances soil salination. These saline soils er crop yields under the optimum production els. Salination effect studies are proposed as studies in salt-tolerant crop breeding. Salinity trol measures are proposed, including land inage, irrigation management, and leaching. mer awareness of both salinity problems and trol methods is emphasized. (Muller-Arizona) 4-05218

E POSSIBILITY OF SODA FORMATION IN IL BY BIOCHEMICAL MEANS, (IN RUS-N),
primary bibliographic entry see Field 2G.
4-05271

PERIENCE OF MEADOW SOIL DESALINA-ON IN MURGAB OASIS (IN RUSSIAN),
Sheripov.
bl Osvoeniya Pustyn'. 2. p 53-57, 1972, English mmary.
ntifiers: Chlorides, Magnesium, Meadow, is, Sodium sulfide, *Soil desalination, SSR(Murgab Oasis), *Salts, *Saline soils, Soil ching.

lization of closed horizontal drainage caused a rp change in soil salt regime in the irrigated as. In lowlands the danger of salt accumulation urs towards the autumn at the backwater in the ector. When reclaiming the heavy saline fallow is, very intensive leaching of sodium chloride bserved. The amounts of sodium sulfide and decrease by 2-2.5 times.--Copyright 1973, logical Abstracts, Inc.
4-05368

. Conservation In Domestic and Municipal Use

VIRONMENTAL GEOLOGY AND DROLOGY, MADISON COUNTY, ABAMA: WATER RESOURCES,
logical Survey, University, Ala. Water ources Div.
primary bibliographic entry see Field 4B.
4-04911

TER RESOURCES AS A BASIS FOR COM-EHENSIVE PLANNING AND DEVELOP-NT IN THE CHRISTINA RIVER BASIN,
aware Univ., Newark. Water Resources ter.
primary bibliographic entry see Field 6B.
4-04988

AILED PROJECT REPORT, DYERSBURG, NNESSEE, FINLEY STREET AREA.
y Engineer District, Memphis, Tenn.
primary bibliographic entry see Field 4A.

W74-04989

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
For primary bibliographic entry see Field 6B.
W74-04991

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-04996

METHODS OF REDUCING POWER CONSUMPTION IN PUMPING WATER IN WATER SUPPLY SYSTEMS, INCLUDING THE USE OF BOOSTER STATIONS,
Moskovskii Inzhenerno-Stroitelnyi Institut (USSR).
For primary bibliographic entry see Field 8C.
W74-05093

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W74-05172

3E. Conservation In Industry

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
For primary bibliographic entry see Field 6D.
W74-04912

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
For primary bibliographic entry see Field 6G.
W74-05083

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05117

EFFECTS OF WASTE WATER RECYCLE IN A PAPERBOARD MILL,
Green Bay Packaging, Inc., Wis.
For primary bibliographic entry see Field 5D.
W74-05254

EFFLUENT-FREE BLEACHED KRAFT PULP MILL: PRESENT STATE OF DEVELOPMENT,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-05275

CLOSED WATER CIRCULATION SYSTEM IN A PAPER AND PAPERBOARD MILL (GESCHLOSSENER WASSERKREISLAUF IN EINER PAPIER-UND KARTONFABRIK),
Papier- und Kartonfabrik Ofteringen (West Germany).
For primary bibliographic entry see Field 5D.
W74-05281

FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 5D.
W74-05282

A PULP AND PAPER MILL WITH FULLY CLOSED RECIRCULATION SYSTEM -- UTOPIA OR REALISTIC POSSIBILITY. (EINE ZELLSTOFF-UND PAPIERFABRIK MIT VOLLSTAENDIG GESCHLOSSENEM KREISLAUF -- EINE UTOPIE ODER EINE REALISTISCHE MOEGLICHKEIT),
Karlstads Mekaniska Werkstad A.B. (Sweden).
For primary bibliographic entry see Field 5D.
W74-05289

3F. Conservation In Agriculture

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
For primary bibliographic entry see Field 4A.
W74-04997

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05001

AGRICULTURAL ASPECTS,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05002

INFLUENCE OF WATER REGIME ON THE INDIRECT ABSORPTION OF RADIOCESIUM, RADIOSTRONTIUM, AND RADIOCOBALT BY LOWLAND RICE,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5B.
W74-05199

THE SOILS OF THE URAL RIVER ZONE IN THE GUREV REGION AND THEIR IMPROVEMENTS DURING IRRIGATION, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Pochvovedeniya.
For primary bibliographic entry see Field 2G.
W74-05205

COTTON: A COMPUTER SIMULATION OF COTTON GROWTH,
Agricultural Research Service, Tucson, Ariz. Cotton Production Research Unit.
H. N. Stapleton, D. R. Buxton, F. L. Watson, D. J. Nolting, and D. N. Baker.
Arizona Agricultural Experiment Station, Tucson, Technical Bulletin 206. 1973, 124 p. 44 fig, 1 tab, 38 refs.

Descriptors: *Cotton, *Plant growth, Model studies, *Computer models, *Simulation analysis, Field crops, Fiber crops, Agriculture, Germina-

tion, Crop production, Growth rates, Growth stages, Height, Productivity, Soil-water-plant relationships, Climatic data, Testing, Productivity, Crops, Cultivation.

The cotton production system is defined by a multi-component flow-chart model. The principal component of the system is the actual cotton plant. A digital computer simulation of a cotton plant is developed. This model uses hourly input data of air temperature, water vapor pressure gradient, incident short wave radiation, carbon dioxide concentration, soil moisture tension, soil temperature, soil impedance to elongation of the hypocotyl, sun altitude and acute angle between sun azimuth and cotton rows to generate hourly water content weight percentage in the seed during the preemergence growth stage and to generate hypocotyl length, change in hypocotyl length, percent of seed that have emerged and percent of seed energy that has been expended during the post emergence growth stage. This model is validated with actual data. Five appendices are included which deal with model input estimation, program variable identification, program use, sample input and output and field monitoring techniques. (Muller-Arizona)
W74-05213

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
For primary bibliographic entry see Field 4A.
W74-05214

THE SUMMER FALLOW SYSTEM,
Oregon State Univ., Corvallis.
T. G. Zinn.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 91-108. 6 fig, 6 tab.

Descriptors: *Agriculture, *Dry farming, *Arid lands, *Fallowing, Rotations, Soil management, Crop production, Farm management Soil moisture, Soil water, Water conservation, Water storage, Cereal crops, Field crops, Forages, Mulching, Rain, Rainfall, Water sources, Soils, Semiarid climates, Cultivated lands.
Identifiers: *Turkey.

While rainfall is too limited to permit annual cropping in many arid and semi-arid areas, such regions including parts of Turkey and the United States, do lend themselves to both partial year cropping and fallow. Such a procedure was found to give a higher total production than annual cropping for winter wheat. The primary purpose of the fallow system is to accumulate moisture in the soil root zone area during no-production periods for the crop to consume during growing periods. The maximum accumulation will occur when proper weed control reduces unwanted evapotranspiration, when the soil has a high infiltration rate to incident rainfall, when the surface of the field is sloped such that surface movement of water is sufficiently slow for proper infiltration, when irregular tillage is avoided which increases soil evaporation surfaces and when a moisture barrier such as mulch is introduced to store accumulated moisture. Such fallow procedures are found optimal in the summer months during which only about 25 percent of the annual rain falls. Summaries are presented for the testing of 80 different treatment combinations over a two-year experimentation period for a study area in Turkey. These studies offer the additional conclusion that treatment timing is important in the fallow process and that mechanization is necessary for the proper timing to be realized. (Muller-Arizona)
W74-05215

AGRICULTURAL ASPECTS OF ARID AND SEMI-ARID ZONES,
Soils Inst., Tehran (Iran).
A. F. Mahdavi.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 52-60.

Descriptors: *Agriculture, *Dry farming, *Arid lands, *Land development, Arable land, Crops, Cultivated lands, Arid climates, Land classification, Land resources, Semiarid climates, Soils, Land use, Ranges, Pastures, Irrigation, Irrigation efficiency, Irrigation programs, Irrigation water.
Identifiers: *Iran.

Seventy-three percent of Iran is arid or semi-arid land, and much of the remainder is mountainous. If Iran is to keep pace with its rapidly growing population, it must expand its agriculture. In attempting is determine the optimal land usage, maps classifying land resources with respect to agriculture (both dry land and irrigated), range, forests and recreation were constructed. Development is planned in light of the recommendations of these surveys. Irrigation and drainage techniques, field leveling and grading, crop water demand, and soil fertility-irrigation interaction are additional technological considerations in the planning process. Four areas of research offer Iran improvements in agricultural yield. Dryland farming, saline soil reclamation, use of water of impaired quality and fertilization are being explored for this purpose. The overall priorities of national research coordination, support of research institutions, integration of activities on the farm level, and regional, national and international exchange of experience are the underlying factors that will lead to the eventual success of Iran's agricultural planning. (Muller-Arizona)
W74-05216

POSSIBILITIES OF SUPPLY AND PROPER USE OF WATER IN THE GARMSAR AREA,
Ministry of Water and Power, Tehran (Iran). Research Div.
For primary bibliographic entry see Field 3C.
W74-05217

EVALUATION OF THE HYDROLOGICAL ASPECTS OF THE AGRICULTURAL STUDIES IN ARID AND SEMI-ARID ZONES OF TURKEY,
Ankara Univ., Adana (Turkey). Faculty of Agriculture.
O. Tekinel.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 225-247. 10 tab, 2 fig.

Descriptors: *Arid lands, *Land use, Water supply, Water supply development, Arid climates, Semi arid climates, Dry farming, Evaporation, Land classification, Hydrologic data, Hydrology, Water utilization, Water demand, Water resources, *Agriculture, Climates, Data collections, Droughts.
Identifiers: *Turkey.

Hydrological and related activities in Turkey, including the definition of climatic zones, the classification used for defining the arid and semi-arid zones, and hydrological activities which have been carried on in Turkey, are discussed. Agricultural drought studies with respect to hydrology and a proposal for drought studies in the agricultural areas of arid and semi-arid zones are summarized. An arid zones research institute should be established to study the problems of the area. Hydrologic surveys are proposed to gather data on climate, land classification, water requirements, water utilization and drought frequency. Studies in evaporation control, usage of water of impared quality, soil-water-plant-energy relationships, and irrigation are proposed. These studies are expected to furnish the necessary data for the evaluation of dryland regions with respect to hydrology and agricultural potential. (Muller-Arizona)
W74-05219

EROSION CONTROL AND VEGETATIVE COVER UNDER DRYLAND CONDITIONS IN TURKEY,
Istanbul Univ. (Turkey). Faculty of Forestry.
S. Uslu.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 159-163.

Descriptors: Agriculture, *Arid lands, *Erosion *Soil erosion, *Erosion control, Arid climates Soils, Vegetation, Wind erosion, Weathering, Soi types, Ground cover effects, Dry seasons, Winds Shelterbelts, Windbreaks, Vegetation effects.
Identifiers: *Turkey.

The morphology of the topography of Turkey i such that the moist air of the surrounding seas i deflected by the ringing mountains and prevente from reaching the central Turkish plains, causin the central plains to be extremely arid. The soils o this region are thus susceptible to wind and wate erosion, both because of the inherent dryness o the soil and because of the lack of holding veget tion. Examples of such erosional conditions a cited. Various control measures are proposed, i cluding the construction and cultivation and win shelterbelts. Specific plant performances in suc belts are reported. Various forms of vegetativ cover to hold the soil are also presented. (Mulle Arizona)
W74-05220

WHEAT PRODUCTION PROBLEMS AN POTENTIALS ON DRYLANDS,
Wheat Research and Training Center, Anka (Turkey).
A. Demirlicakmak.
In: Agricultural Aspects of Arid and Semi-a Zones, CENTRO seminar, 1972, p 172-178. 2 tab

Descriptors: *Wheat, Agriculture, *Dry farmi *Arid lands, *Irrigation water, Fallowing, Fa management, Cereal crops, Grains(Crops), Fi crops, Irrigation, Soils, Soil water, Soil moistu Moisture content, Antecedent moisture, Infilt tion, Moisture availability, Retention, S management, *Water yield improvement.
Identifiers: *Turkey.

Wheat is the principal agricultural commodity Turkey. The production of this commodity has creased an average of 33 percent per annum o the last 20 years to a level where little land rema for agricultural expansion. Much of the land c rently in cultivations is in arid areas with insu cient water for optimal production. Curr research is aimed at augmenting the quantities water used in irrigation and improving irrigat methods to increase wheat production. This ac tional irrigation water is to be obtained by w conservation practices on available precipitat water. These practices include weed control, in tration encouragement through tillage practic and fallow processes. New varieties of wheat a offer some possibilities in increased product The Wheat Research and Training Center in kara, Turkey, is conducting research in th fields. (Muller-Arizona)
W74-05221

LAND AND WATER RESOURCE DEVEL MENT FOR CROP PRODUCTION IN TURKE
Ankara Univ. (Turkey). Dept. of Agricultural gineering.
A. Balaban.
In: Agricultural Aspects of Arid and Semi- Zones, CENTRO seminar, 1972, p 138-150. 2 ta

Descriptors: *Water resources developm *Land resources, *Land development, W resources, Land, Land Management, Land re mation, Land use, Water supply, Water su development, Groundwater, Groundw resources, Groundwater availability, Irrigation rigable land, Irrigation programs, Drainage, face drainage, Salinity, Soils.
Identifiers: *Turkey.

Land and water resources, the existing level of development and problems associated with it, and new approaches to such problems on the Turkish peninsula are reviewed. Turkey has a total land area of 78.1 million hectares, of which about 35 percent of this is cultivated, 26 percent is in grass and pastureland and the remaining 39 percent is forest and unproductive land. The agricultural portion has expanded greatly in recent years, in part due to reclamation projects of swamps and wild olive groves. A survey of the available water resources in Turkey shows that the 26 principal drainages in the country have an annual potential of 166 billion cubic meters. Of this about 80 billion cubic meters can be feasibly developed. An additional 8 billion cubic meaters of safe yield groundwater make the annual total available water resources of Turkey 88 billion cubic meters. Existing levels of cropland expansion and irrigation development are discussed. An additional expansion of 25.5 million hectares of agricultural land may be developed from dry lands and supported by the available water resources. (Muller-Arizona)
W74-05222

SYSTEMS ANALYSIS: A DECISION-MAKING TOOL FOR ARID LAND DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 6A.
W74-05223

IMPROVING FARM PRODUCTION IN REGIONS OF LIMITED RAINFALL,
Agency for International Development, Washington, D.C. Office of Agriculture and Fisheries.
O. J. Kelley.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 12-24. 1 tab.

Descriptors: *Dry farming, *Water harvesting, *Rain water, Water conservation, Agriculture, *Arid lands, Farm management, Precipitation(Atmospheric), Soil water, Runoff, Water yield improvement, Water storage, Water supply, Soil-water-plant relationships, Soil moisture, Water management(Applied), Infiltration, Land use, Land management.

Arable land in dry regions is normally irrigated to make it agriculturally productive. Such irrigation is usually done with nearby water supplied. When such water supplies are not availabl, these lands are forced to produce with the limited amount of precipitation water available. These conditions lead to the necessity of dry land farming: the conservation of the limited available precipitation water and its optimal use in agriculture. The first aspect of dryland farming entails runoff loss minimization, soil water storage, crop yield incrementation with increased water supply, snow conservation, and optimal use farming methods. The second aspect involves water harvesting, the increase of available water through collection and redistribution systems. If these aspects are realzed, it remains to employ the stored water in the most efficient method possible. This must be done by evaluating the optimal use to which the water and associated land may be put (grazing, cultivation, etc) and the optimum technique by which this use may be realized. These dry land farming procedures, when practiced within an overall development plan, lead to the maximum production of lands with otherwise insufficient water supply. (Muller-Arizona)
W74-05224

THE ARID ZONE PROBLEMS IN TURKEY,
Ankara Univ. (Turkey). Faculty of Agriculture.
S. Elci.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 45-51.

Descriptors: *Agriculture, *Dry farming, Forages, Pastures, Pasture management, Crop production, Forage grasses, Grazing, Irrigatin practices, Range management, Soil management, Regional development, Irrigable land, Irrigation, Land development, Land management, Arid lands, Arid climates, Asia.
Identifiers: *Turkey.

The population growth rate of Turkey indicates that if its people are to be fed in the future the agriculture of that country must be greatly expanded. Several limiting factors exist concerning such expansion. Much of Turkey's agricultural land is arid. Precipitation is both little and poorly distributed through the growing year. An analysis of agricultural development priorities shows the development and exploitation of pasture lands is a desirable course of action. Several good forage crops which would be useful to this end are not grown in Turkey, although their origin is there. The cultivation of plants for optimal forage production should be based on rotation, soil and climatic conditions for plant production in the region. Twenty-four points of consideration are presented which must be examined to this end. An additional 16 long-term research topics are presented which should be examined for long-range effective agriculture development. The rapid development of arid zone agriculture, such as that required by Turkey, should be conducted along these study guidelines for solid planning bases. (Muller-Arizona)
W74-05225

INVASION OF SEMIDESERT GRASSLAND BY VELVET MESQUITE AND ASSOCIATED VEGETATION CHANGES,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
D. R. Cable, and S. C. Martin.
Journal of the Arizona Academy of Science, Vol 8, No 3, p 127-134, October 1973. 5 tab, 9 fig, 8 ref.

Descriptors: *Succession, *Mesquite, *Grasslands, Grasses, Brush, Desert plants, Range management, Weed control, Grazing, Semiarid climates, Vegetation, Forage grasses, *Arizona, Control, Cutting management, Invasion, Plant populations, Range grasses, Plant groupings.

The encroachment of velvet mesquite on the grass-covered rangeland of the semiarid southwestern United States has become a significant problem to grazing in the last half century. It has been shown that as few as 25 mesquite trees per acre can reduce the available perennial grass production by fifty percent. This study examined several grassland plots at two locations in southern Arizona in an attempt to determine the invasion rates of mesquite into the grassland environment. Stem diameter, plant height, and crown width were the plant parameters considered and plant density was the plant community parameter employed. Four samplings over a 20-year period of record were made and mesquite occurrence data analyzed. Velvet mesquite was found to increase significantly in the study areas during the period of observation. Plots which remained undisturbed during the entire observation period showed dramatic reductions in grass productivity due to mesquite encroachment. Bulldozing and burning of plots interrupt mesquite invastion only temporarily, indicating persistent periodic control measures would be required for proper control. Herbaceous vegetation was not influenced by mesquite population changes as was the perennial grass. Early and repeated control measures are optimum. (Muller-Arizona)
W74-05226

SANTA RITA EXPERIMENTAL RANGE: YOUR FACILITY FOR RESEARCH ON SEMIDESERT ECOSYSTEMS,
Forest Service (USDA), Tucson, Ariz., Rocky Mountain Forest and Range Experiment Station.
S. C. Martin, and H. G. Reynolds.
Journal of the Arizona Academy of Science, Vol 8, No 2, p 56-67, June 1973. 5 fig, 1 tab, 179 ref.

Descriptors: *Desert plants, *Deserts, *On-site laboratories, *Research facilities, Pastures, Climates, Grasslands, Ecology, Range management, Semiarid climates, Arid lands, Ranges, Range grasses, Forage grasses, Brush, Vegetation regrowth, Land use, Sites, Habitats, *Arizona.

The Santa Rita Experimental Range, a 50,000-acre experimental facility 30 miles south of Tucson, Arizona, is a research site for semidesert ecosystems that has been used continuously for 70 years. Rainfall averages from 10 inches per year at the lower elevations to almost 20 inches per year in the uplands. The area is predominantly grass and brushland with a great variety of semiarid land wildlife. To date studies include grazing, range seeding, grass-shrub ecology, wildlife, and desert biomes. Because of its location, the area lends itself to a variety of arid and semiarid land studies associated with hydrology and water resources. Since the Range is purely a study site, the natural environment has been distrubed to a minimum, making Santa Rita Experimental Range an ideal outdoor laboratory. (Muller-Arizona)
W74-05227

REMOVAL OF NITROGEN FROM TILE DRAINAGE-A SUMMARY REPORT, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
For primary bibliographic entry see Field 5D.
W74-05228

NUTRIENTS FROM TILE DRAINAGE SYSTEMS, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
For primary bibliographic entry see Field 5B.
W74-05229

PROBLEMS OF THE ORGANIC MATTER OF ORGANOGENIC SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05279

DENSITY OF GROWTH AND LEVEL OF FERTILIZATION AS INFLUENCING THE WATER CONSUMPTION OF MAIZE, (IN BULGARIAN),
Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of Cotton.
G. Nikolov.
Rasteniev'd Nauki. Vol 9, No 4, p 69-82. 1972. Illus. (English summary).
Identifiers: *Fertilization, *Growth, *Corn(Field), Water consumption, *Bulgaria, Irrigation.

The water consumption of maize grown under irrigation on leached chernozem smolnitsa soil was studied in 1966-1969 at crop stands of 32,000, 44,000 and 58,000 plants/ha, at row spacings of 70 and 90 cm and at levels of fertilization in kg/ha of N100P80K10 and N200P160K80. The consumptive use of water of maize varies comparatively a little with increasing the number of plants per hectare and with raising the level of fertilization and does not vary in dependence on the inter-row spacings. A rectilinear relation exists between the 24-hr values of the consumptive use of water, the leaf area, the increment in the biological yield and net productivity of the photosynthesis which determines the correlation between the rhythm of water consumption during the crop-season and the related productivity of organic substance. Water withdrawn from the upper 50 cm soil layer accounts for 66.8-68.9%. from the 51-100 cm layer for 23.8-25.0%, and from the 101-200 cm soil layers

for 7.2-8.5% of the water consumption of maize. The total amount of irrigation water given to the crop accounts for 37.0-37.5%, rainfall during the crop-season for 37.1-39.3% and the withdrawal from the water stored in the soil accounts for the least percentage. The consumptive use of water of maize grown in South-Bulgarian chernozem smolnitsa soils, at a crop density of 44,000 plants/ha and at fertilizer level of N200P160K80 in kg/ha amounts to 523 mm and its 24-hr values average 3.96 mm. The biological coefficient of water consumption after A. M. Alpatev varies between 0.46 and 0.51 and has a mean value of 0.50.--Copyright 1973, Biological Abstracts, Inc.
W74-05339

EFFECT OF AN EXCEPTIONAL STORM ON SOIL CONSERVATION AT SAMARU, NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 2J.
W74-05340

IN VITRO INTERACTIONS OF FUSARIUM AND VERTICILLIUM WILT FUNGI WITH WATER, PH AND TEMPERATURE,
J. B. Manandhar, and G. W. Bruehl.
Phytopathology. Vol 63, No 3, p 413-419. 1973. Illus.
Identifiers: *Cotton diseases, *Fungi, *Fusarium-Oxysporum-F.-Sp.-Vasinfectum, Growth, In-vitro interactions, Soils, Temperature, *Verticillium-Albo-Atrum, Wilt, Hydrogen ion concentration.

Fusarium oxysporum f. sp. vasinfectum and the microsclerotial form of Verticillium albo-atrum pathogenic to cotton grew progressively slower in soil as the predominantly matric water potentials in soil were lowered below 0. In contrast, both fungi grew optimally at about -10 to -30 bars at 25C in either agar media or in soil when water potential was regulated osmotically. The osmotic stimulation of both fungi was independent of the solute used and occurred in agar media when water potentials were adjusted with NaCl, KCl, CaCl2, MgCl2, a salt mixture, or sucrose, and on straw in sterile soil when water potentials were osmotically adjusted. At water potentials below the stimulatory range, growth decline linearly and was zero at near -100 bars for V. albo-atrum and at near -115 bars for F. oxysporum. A water stress of -40 to -60 bars reduced the growth of both to about half the maximum rate. Both fungi grew well at pH values ranging 5.2-8.6, and no significant interactions of pH and water potential were observed. A highly significant temperature X water interaction occurred in both wilt fungi: the magnitude of growth stimulation with slightly reduced osmotic water potential increased with rising temperature. No new in vitro responses to water, pH, temperature, or to interactions of these were observed that explain the different distributions of these wilt fungi in nature.--Copyright 1973, Biological Abstracts, Inc.
W74-05341

EFFECT OF GREEN FERTILIZER ON GRAPE YIELD,
For primary bibliographic entry see Field 5B.
W74-05346

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
For primary bibliographic entry see Field 5C.
W74-05357

WATER PROPERTIES AND WATER REGIME OF SOD PODZOLIC SOILS AND MEANS OF THEIR IMPROVEMENT (IN RUSSIAN),
K. I. Baltyan.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 193-202, 1970.
Identifiers: Cereal crops, Frost, Grass, Perennial grasses, Plowing, Potato, Pulses, *Sod podzolic soils, Soils, Spring, Water supply, Winter, *Root zone, *USSR(Moscow region).

The water supply for crops on sod podzolic soils in the Moscow region, USSR, may be improved by a single meliorative plowing, whereby the humus horizon is left on the top and the underlying podzolic and illuvial horizons are intermixed. Thus, the depth of the root zone may be extended to 30 cm in the northern and eastern regions and to 40 cm in the southern and western regions of the non-chernozem zone for perennial grasses and winter crops that complete their growth before the onset of autumn frosts. For spring cereal crops, pulses, potatoes and other crops of low resistance to frost, the root zone can be deepened to 20 and 30 cm.--Copyright 1973, Biological Abstracts, Inc.
W74-05370

THE USE OF MINERAL FERTILIZERS IN IRRIGATION WITH PURE WATER, SEWAGE AND LIQUID MANURE, (IN RUSSIAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Leipzig (East Germany). Institut fuer Mineraldueng.
R. Koriat, and G. Shpekht.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 177-186. 1970.
Identifiers: Beet, Clover, *Fertilizers(Mineral), Fodder, Grass, Irrigation, Liquid manure, Minerals, Nutrition, Potato, Pure, *Sewage, Sugar, Nitrogen, *Farm wastes, *Nutrients, *Phosphorus.

More nutrients, especially P, are extracted by the field crops irrigated with plain water than without irrigation. The N doses and irrigation rates for sugar and fodder beets, potato, grasses and clover recommended in the German Democratic Republic are given. The amount of nutrients in sewage cannot compensate the large uptake by the crops (on the average, 100 mm communal sewage contains 60 kg N, 76 kg P2O5 and 42 kg K2O). Sprinkling with sewage is supplemented with P 70-90 and K 80-100. N fertilizers are especially important. The doses of liquid manure and its application dates for field crops and hay cutting pastures are given. Liquid farmyard manure contains 0.45% N, 0.08% P and 0.23% K. Assimilation of nutrients from liquid manure amounts to 40-80% N, 55-90% K, depending upon the dates of application. The utilization factor for P is 50%.--Copyright 1973, Biological Abstracts, Inc.
W74-05371

MOISTURE AND TEMPERATURE REGIMES IN THE SOUTHERN-TAIGA SOILS OF CENTRAL SIBERIA AND HABITAT CONDITIONS FOR CROPS, (IN RUSSIAN),
V. T. Kolesnichenko.
Inf Byull Sib Inst Fiziol Biokhim Rast Sib Otd Akad Nauk SsSR. 6. p 140-142. 1970.
Identifiers: Air, Crops, *Moisture, Soils, *Temperature, Thermal regime, *USSR(Biryusa River), *Podzolic soils.

Observations were carried out on sod podzolic and gray forest podzolized soils on the left bank of the Biryusa River, north of Taishet, USSR. The hydrothermal air regime features in the soils and the adjacent 0-200 cm air layer were determined. The determinations include the drop of air temperature at night in the different phases of plant development, the types of frosts in air and on the soil surface, and their effect on the temperature regime in the top 50-cm-layer of soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05373

EFFECT OF CROPS AND THEIR PREDECESSORS ON THE AGGREGATE COMPOSITION OF MEADOW SIEROZEM SOILS, (IN RUSSIAN),
P. S. Bulakhova.
Tr Kaz S-Kh Inst. Vol 13, No 2, p 117-121. 1970.
Identifiers: Barley, Beet, Corn, *Crops, Meadow, Peas, *Sierozem soils, Wheat, *Soil aggregates.

The aggregates were separated on sieves in water after preliminary capillary saturation of the soil sample. Observations indicated that the meadow sierozem soils possess good water-stable structure. The total aggregates larger than 0.25 mm in the top 60-cm layer make up from 65-79%, of which the most valuable aggregates, 5-1 mm, amount to 26%. The effect of different crops on the aggregate composition of the soil varies. Under corn the total aggregates exceeded by 6-8% the amount under wheat, down to a depth of 40 cm; it was higher by the same amount under wheat at the depth of 40-60 cm, and mainly on account of aggregates measuring 2-1 mm. The content of aggregates was markedly lower under barley following wheat after beet, down to 45-28%, while aggregates measuring 5-1 cm dropped to 19-25%. The decline was marked in particular among aggregates 2-1 mm, being only 11% in the upper horizon under barley, as against 32 and 20% under corn and wheat, respectively. The effect of pea crops on soil structure proved to be most favorable.--Copyright 1973, Biological Abstracts, Inc.
W74-05374

SOME DATA ON SECONDARY SALINIZATION OF KRASNOZNAMENSKII IRRIGATED MASSIF, (IN RUSSIAN),
K. E. Burzi.
Ahrokhim Hruntozn Resp Mizhvid Temat Zb. 15 p 186-190. 1070.
Identifiers: *Irrigation, Massif, *Salinization(Soils), *USSR(Krasnoznamenskii), *Saline soils, Drainage.

The rise of the groundwater levels from 4 to 2 m due to filtration from the main canal and the irrigation network, led to secondary salinization of low-lying areas on the territory of the 'Pamyat' Il'icha State Farm (sovkhoz), USSR. Swamping and secondary salinization can be stopped and prevented by drainage.--Copyright 1973, Biological Abstracts, Inc.
W74-05376

AGROCHEMICAL PROPERTIES AND FORMS OF PHOSPHATES IN TYPICAL SIEROZEMS IRRIGATED AT VARIOUS TIMES, (IN RUSSIAN),
M. M. Tashkuziev.
Nauchn Tr Tashk Univ. 378. p 187-194. 1970.
Identifiers: *Agrochemical properties, Irrigation, *Phosphates, *Sierozems, *Soil types, Fertilizer.

Data are presented on the studies conducted on virgin, newly irrigated and old-irrigated soils. Copyright 1973, Biological Abstracts, Inc.
W74-05377

THE EFFECT OF DIFFERENT TILLAGE METHODS ON THE PHYSICAL PROPERTIES OF SOIL, (IN RUSSIAN),
Grodnenskii Selskokhozyaistvennyi Institut (USSR).
For primary bibliographic entry see Field 2G.
W74-05378

EFFICACY OF LARGE DOSES OF MINERAL FERTILIZERS IN IRRIGATED SOILS, (IN RUSSIAN),
Z. Ban'okh.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 169-176. 1970.
Identifiers: Alfalfa, Beets, Corn, *Fertilizers(Mineral), Irrigation, Minerals, Potatoes, Sugar, *Czechoslovakia, *Soils(Irrigated), *Phosphorus, *Potassium.

Long-term experiments were conducted in the main irrigated regions of Czechoslovakia with doses of P and K for potato, alfalfa, sugar beet and corn. Large doses of fertilizers were slightly effective, but the use of such doses should be considered from the standpoint of improving soil fertility.--Copyright 1973, Biological Abstracts, Inc.
W74-05379

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3A.
W74-05382

THE ECONOMIC EFFICIENCY OF INTER-BASIN AGRICULTURAL WATER TRANSFERS IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W74-05385

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
G. McManis.
Available from National Technical Information Service as PB-228 698 $8.00 in paper copy, $1.45 in microfiche. MS Thesis, May 1972. 94 p, 28 fig, 3 tab, 10 ref, 5 append. OWRR B-016-NEB(1).

Descriptors: *Simulation analysis, *Hydrographs, Storms, *Computer programs, *Drainage systems, Channels, *Networks, Runoff, Systems analysis, Mathematical models, *Nebraska, City planning, *Urban drainage, Storm drains.
Identifiers: Lincoln(Neb).

Dynamic simulation techniques can provide urban water planners with needed hydrologic response information. Such techniques for modeling the interactions between (1) a storm bounded by a generalized polygon, and (2) any arbitrarily distributed network over which the storm passes are described and demonstrated. A simulator for the hydrologic response of any encoded channel network has been designed and implemented in FORTRAN. The network is represented by a binary tree structure within which the topologic connections, geometric and other attributes of its segments can be introduced, altered, and retrieved by a set of programmed functions. The comprehensive computer package can model either the behavior of existing drainage systems or the expected performance changes from modification of drainage systems. The simple, yet detailed distributed model has the potential of revealing worst-case velocities or patterns for moving storms. The model has been applied to an existing drainage system, simulating both the runoff at any point and the cumulative behavior in relation to a given storm description. (Bell-Cornell)
W74-04852

THE IDENTIFICATION AND QUANTIFICATION OF THE NET EFFECTS OF MULTIPLE-PURPOSE RIVER BASIN DEVELOPMENT,
Georgia Univ., Athens. Inst. of Natural Resources.
R. M. North, and J. Sellers.
Available from National Technical Information Service as PB-228 588 $11.50 in paper copy, $1.45 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Atlanta, Report ERC-0773, June 1973. 155 p, 5 fig, 16 tab, 189 ref, 2 append. OWRR A-040-GA(2). 14-31-0001-3810.

Descriptors: *Evaluation, *Project feasibility, *River basin development, *Cost benefit analysis, *Social aspects, *Economic feasibility, Project planning, Water control, *Appalachian Mountain Region, Alternative costs, Flood control, Water quality, Tennessee Valley Authority, North Carolina.
Identifiers: Upper French Broad River basin(N.C.), Multiple objective planning.

A methodological and pragmatic basis is presented from which to measure and evaluate future river basin development projects within the framework of multiobjective principles and standards. The Upper French Board River Basin and a proposed 14-reservoir TVA project within the basin were selected for a case study of traditional benefit-cost analysis and subsequent multiple-objective comparisons with the national economic development, environmental, social, and regional economic development analyses. The areas of economic theory and public finance were integrated with the environmental aspects to develop a systematic process for evaluation of benefits and costs considering resources displaced as well as environmental and social costs imposed. The benefits claimed and views held for public investments in water resources by various interest groups were explored for the region. No significant relationship between the presence of water resources projects and economic activity was found for a region in which water resources is not the limiting factor in the economic mix. Specific methodological and field level improvements are suggested for future water resources project evaluation to insure consideration of the complete range of alternative solutions to flood control, recreation, water supply and other problems while minimizing adverse economic, environmental, and social impacts.
W74-04854

OPTIMIZATION OF OPERATION OF A SYSTEM OF FLOOD CONTROL RESERVOIRS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
A. T. Hjelmfelt, Jr., and N. X. Tsiourtis.
Available from National Technical Information Service as PB-228 606 $9.75 in paper copy, $1.45 in microfiche. Missouri Water Resources Center Completion Report, July 1973, 122 p, 37 fig, 8 tab, 9 ref, 2 append. OWRR B-065-MO(1). 14-31-0001-3607.

Descriptors: *Flood control, *Probability, *Linear programming, *Optimization, *Reservoir operation, *Reservoir releases, Time series analysis, Computer program, Hydrographs.
Identifiers: *Kansas River basin.

Probabilistic methods of hydrology and optimization techniques were used to determine an optimal sequence of releases from a system of reservoirs during a flood emergency. The operation schedule for a reservoir was determined from estimated inflow to the reservoir, current reservoir contents and downstream conditions. Linear programming was used to establish the optimal operating procedure. The duration of the flood producing storm was divided into a series of equal time increments, an inflow into each reservoir estimated for each time increment and a release made from each reservoir during each time increment. The objective function (to be maximized) was taken to be the sum of all reservoir releases during the duration of flood inflow to the reservoirs.
W74-04858

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6D.
W74-04915

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel, L. Duckstein, and C. C. Kisiel.
Paper presented at 54th Annual Meeting of American Geophysical Union, April 16-20, 1973, Washington, D.C. 20 p, 5 fig, 10 ref. OWRR B-032-ARIZ(4).

Descriptors: *Snowmelt, *Runoff forecasting, *Reservoir operation, *Statistical models, *Stochastic processes, Melting, Temperature, Rainfall, Snowpacks, Water equivalent.

A methodology is given to forecast snowmelt to allow managers of water resources systems to regulate reservoir releases to minimize expected losses. Using an event-based precipitation model, a distribution function of water available for runoff is obtained. The amount of water available for runoff is the sum of the water equivalent of snow on the ground at the time the forecast is made, and the predicted amount of precipitation during the forecast period. A melt coefficient, a random variable, is a function of predicted temperature. The distribution function of snowmelt runoff is the product of the two random variables involving the predicted precipitation and temperature. A one-period objective function is defined to determine a reservoir release rate which would minimize expected losses. (Knapp-USGS)
W74-04918

HYDROLOGIC CHARACTERISTICS OF ALDER CREEK, IRON COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
B. K. Holmstrom, W. A. Gebert, and R. G. Borman.
Open-file report, June 1973. 10 p, 9 fig, 8 tab, 6 ref.

Descriptors: *Streamflow, *Sedimentation, *Wisconsin, *Reservoirs, Floods, Peak discharge, Low flow, Sediment yield, Hydrologic data, *Preimpoundment.
Identifiers: Alder Creek(Wisc).

The hydrologic characteristics of Alder Creek, Iron County, Wisconsin, were studied so that water-resource planners could evaluate a reservoir site. The hydrologic characteristics estimated were the mean flows, low flows, flood peaks, suspended-sediment discharge, and depth to bedrock. Also included is an estimate of the time required to fill the proposed reservoir. The probable maximum flood (PMF) at the damsite of the proposed reservoir has a peak of 41,000 cfs and a 24-hour volume of 19,700 acre-feet. A full reservoir reduces the time of concentration of storm runoff, which results in a higher peak discharge than under preimpoundment conditions. The estimated filling times ranged from 18 months for an elevation of 1,410 feet to 76 months for an elevation of 1,430 feet. Sediment deposition was estimated to be 220 tons per year. (Knapp-USGS)
W74-04920

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
M. D. White.
Available from the National Technical Information Service as PB-229 087, $4.50 in paper copy, $1.45 in microfiche. Technical Report 64, Cornell University Water Resources and Marine Sciences Center, Ithaca, N.Y., May 1973. 24 p. OWRR A-027-NY(3). 14-01-0001-1852.

Descriptors: *Water supply, Water resources, *Water transfer, *Interstate, *Water law, *State jurisdiction, *Percolating water, Federal jurisdiction, New York, Regulation, Water pollution control, Groundwater.
Identifiers: Property rights.

Recently, Federal and State agencies have instituted water management and programs to prevent and/or clean up water pollution for purposes of maintaining the availability of adequate water supplies. Significant problems in water supply, however, result in transferring quantities of water between states. In view of the present national water crisis, Federal government regulation of interstate water transfer is often advocated. But in the absence of Federal action, the states must protect and manage their own groundwater resources. States can protect their percolating water resources only by valid conservation laws, not by antiexport statutes which discriminate against out-of-state users. (Bell-Cornell)
W74-04980

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

DETAILED PROJECT REPORT, DYERSBURG, TENNESSEE, FINLEY STREET AREA.
Army Engineer District, Memphis, Tenn.
July 1972. 19 p, 6 plates, 2 tab, 4 append.

Descriptors: *Levees, *Flood control, *Sumps, *Institutional constraints, *Project planning, Flood protection, Drainage, Pumping, Drainage programs, Cost-benefit analysis, Project purposes, Channel improvement, Hydraulics, Environmental effects, Recreation, *Tennessee.
Identifiers: *Urban renewal, Gravity outlets, Dyersburg(Tenn), North Fork, Forked Deer River(Tenn), Environmental impact.

The purpose of the project is to provide flood protection to the southwestern sector of Dyersburg, Tennessee, north of the North Fork, Forked Deer River. The area, adjacent to th central business district, contains both commercial and residential land uses, as well as being the site for an urban renewal program under the Department of Housing and Development. Plans were formulated with a primary objective of providing the 50 and 100 year flood protection requirements of the Federal Housing Administration for the urban renewal area. Construction of a levee is proposed. This necessitates provisions for interior drainage of the area. Drainage is primarily through two small channels tributary to the Forked Deer River. Several project features are designed to provide protection for all interior areas above elevation 269 feet mean sea level: (1) gravity outlets, which will discharge runoff through culverts under the levee; (2) excavated sump on the landside of the levee to provide approximately 148 acre feet for storage of interior runoff; (3) pumping station and outlet structure, when the excavated sump does not provide sufficient storage; and (4) interior channeling to transition flows into the excavated sump. A cost-benefit analysis is included. (Hoffman-North Carolina)
W74-04989

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
Prepared for the City of Sanford, North Carolina. June, 1973. 24 p, 10 fig, 5 tab, 22 plates.

Descriptors: *Flood data, *Peak discharge, *Overflow, *Flood plains, Flood recurrence, Maximum probable flood, Flood profiles, Flood damage, Hydrograph analysis, Streams, *North Carolina.
Identifiers: *Big Buffalo Creek(N.C.), Little Buffalo Creek, Sanford(N.C.), Intermediate Regional Flood, Standard Project Flood.

Areas of Sanford subject to flooding from Big Buffalo Creek between McNeil Road and Wicker Steet Extension (3.11 miles), and from Little Buffalo Creek, between Northview Road and Rose Street (4.6 miles) are identified. Total drainage area of Big Buffalo Creek is 20.8 square miles; while the total drainage area of Little Buffalo Creek is 11.5 square miles. Property within flood plains, primarily residential and commercial, has been damaged by previous floods in 1945, 1952, and 1954. Development of the extensive open spaces along the creeks, expected with the expansion of the City of Sanford, would increase the severity of flood damage. Flood impact assessments are based upon estimated peak flows of the Intermediate Regional Flood, defined as one that could occur once in 100 years on the average, and the Standard Project Flood, defined as a major flood culminating from a severe combination of meterological and hydrological conditions. Peak discharges are given for selected locations. For Big Buffalo Creek at McNeil Road, peak discharges are estimated at 6,400 cubic feet per second for the Intermediate Region Flood and at 12,340 cubic feet per second for the Standard Project Flood. For Little Buffalo Creek at Northview Road, peak discharges are estimated at 2,600 cubic feet per second for the Intermediate Regional Flood and at 5,170 cubic feet per second for the Standard Project Flood. Discharge hydrographs are included. The relative water surface elevations for the Intermediate Regional Flood and the Standard Project Flood are graphed. Overflow limits for both Big Buffalo Creek and Little Buffalo Creek are detailed on contour maps. (Hoffman-North Carolina)
W74-04993

FLOOD PLAIN INFORMATION; ROANOKE RIVER-CHOCOYOTTE CREEK; CITY OF ROANOKE RAPIDS AND TOWN OF WELDON, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
Prepared for the City of Roanoke Rapids and the Town of Weldon. June, 1973. 34 p, 10 fig, 7 tab, 16 plates, glossary.

Descriptors: Floods, *Flood data, *Flood profiles, Flooding, *Flood frequency, Flood damage, Flood control, Flood plain zoning, Flood plain, Historic floods, *North Carolina, Land use, Flood recurrence interval, Maximum probable flood.
Identifiers: Roanoke River(N.C), Chocoyotte Creek(N.C.), Roanoke Rapids(N.C.), Intermediate Regional Flood(IRF), Standard Project Flood(SPF), Weldon(N.C.).

Flooding from Roanoke River and Chocoyotte Creek has severely damaged the towns of Roanoke Rapids and Weldon in 1912, 1940, 1944, and 1945. To aid flood plain utilization and flood damage reduction, areas subject to possible future floods are identified. Factors affecting the flood intensity in these areas include floodflow obstruction, floodflow reduction measures, evacuation plans, and material storage on the flood plain. The Intermediate Regional Flood (IRF) is defined as a flood that could occur once in 100 years, while the Standard Project Flood (SPF) is a major flood expected to occur from the most severe meteorological and hydrological conditions. The extent of flooding, velocity of flow, and rates of rise and duration of flooding are calculated for both bodies of water and types of floods. Floods on the Roanoke River are characterized by slow rates of rise and long duration above flood stage, while floods on Chocoyotte Creek rise to a peak quickly, but with shorter duration. Areas covered by both flood types would be extensive and include commercial, industrial, and residential areas, but due to wider extent, greater depth of water, higher velocity of flow, and longer duration of flooding, damage Standard Project Floods is more severe than during Intermediate Regional Floods. (Grden-North Carolina)
W74-04994

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
H. A. W. Morrice, and W. N. Allan.
Proceedings, Institution of Civil Engineers, Vol 14, p 101-156, October, 1959 18 fig, 13 tab.

Descriptors: *Computer models, *Irrigation, *River forecasting, River basin development, Planning, *Simulation analysis, River regulation.
Identifiers: *Nile River Valley Plan.

Computer simulation was used to determine the best way to control the Nile River and its tributaries in order to maximize water available for irrigation. Possible sites for control works on the Nile and its tributaries were identified, and working arrangements between them specified. These then took the form of algebraic control equations. Assumed quantities of water to be abstracted at various points in the Sudan and at Aswan in Egypt were stated as proportions of the net volume available. River behavior between 1905 and 1952 was used in the analysis. Time lags, transmission and evaporation losses, and the initial content of reservoirs were taken into account. Flow diagrams summarize the logic. The final result, the Nile River Valley Plan, is the product of successive improvements in the control equation. It gives maxima and minima for reservoir contents and controlled discharges, evaporation losses, benefits from certain conservation works, volumes of water available for irrigation, and figures for hydro-electric power. (Hoffman-North Carolina)
W74-04997

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
M. Borlin.
Organization for Economic Cooperation and Development, Paris. Series: Problems of Development. 1971. 94 p, 5 fig, 9 tab, 86 ref, 2 append.

Descriptors: *River basin development, *Simulation analysis, *Econometrics, Benefit-cost analysis, Forecasting, Decision-making, Methodology, *Alternative planning.

A simulation model that would enable the policymaker to analyze the effects of alternative river basin development schemes on target variables such as total population, employment rate, and income per head of household is presented. Final selection of the best development project can then be determined by cost-benefit analysis. The model attempts to internalize as many variables as possible, so that the model is nearly closed. It is modular in form, with submodels being concerned with the agricultural sector, the demographic sector, the employment sector, the income sector, and the water sector. The river basin is divided into subregions. Although the model of each subregion incorporates all the different subsectors, the subregions themselves are only linked through the water subsector. The water outflow of the upstream subregion is the inflow of the downstream subregion. The model is dynamic in that it includes explicit feedbacks, loops, delays, and time-related variables. Results are given year by year. (Hoffman-North Carolina)
W74-04999

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
M. Klasema.
Planning and Development in the Netherlands Vol 4, No 1, p 8-27, 1970. 8 fig, 5 photos.

Descriptors: *Water management(Applied), *Reclamation, *Land reclamation, *Water quality, *Salinity, Land management, Flood control, Dikes, Lakes, Water, Reservoirs, Drainage systems, Water level, Sluices, Water demand, Water policy, Water supply, Sea water.
Identifiers: *Netherlands(Zuiderzee), Act for Enclosure and Partial Reclamation of the Zuiderzee, North Sea, Polders.

Water management has played an important role in the Netherlands way of life. As early as the twelfth century, the Dutch built dikes to discourage flooding. However, it was not until the nineteenth century that technology provided the tools for reclaiming polders from the sea. A plan suggested fifty years ago by engineer Cornelis Lely forms the basis of the Act for the Enclosure and Partial Reclamation of the Zuiderzee. It specified separating the Zuiderzee from the North Sea with a closed dike, laying out polders around the Zuiderzee, and maintaining large fresh water basins within the enclosure. Border lakes are now being created between the polders and the mainland. These lakes are divided into reservoirs to improve the quality and level regulation of the water. Water quality, especially with regard to salt content, is important since the water washes through the reservoirs and is used for irrigation and for consumption. Such reservoirs also serve as a safeguard for water quality in the event of calamity in the enclosure. In the future, the water supply of the Netherlands may be centralized, using the Zuiderzee area as the largest source of storage. (Grden-North Carolina)
W74-05000

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
L. Wijers.
Planning and Development in the Netherlands, Vol 4, No 1, p 42-61, 1970. 26 fig.

Descriptors: Reclamation, *Land reclamation, Optimum development plans, *Comprehensive planning, *Area redevelopment, *Water control, Land farming, Drainage systems, Sea water, Land use, Urbanization, Long-term planning, Gulfs, Land management, Vegetation establishment, Regional economics, Dikes.
Identifiers: *Netherlands(Zuiderzee), Landscape development, Open plan, Polders, Conurbation, Vieringermeer(Neth), Noordoostpolder(Neth), Oostelijk Flevoland(Neth), Zuidelijk Flevoland(Neth), Markerwaard(Neth).

The reclamation from the sea of the Netherlands' Zuiderzee area adds one-fifth of the country's total surface and shortens the distance between the northern and western parts by one-third. Four polders have been reclaimed sequentially since 1930, with the fifth to be ready by 1980. Through this time sequence, each polder acquires a function determined by the social and economic conditions at its construction time. Using knowledge obtained with each previous polder, State authorities may dry polders with regard for an optimum physical plan. For example, the recently reclaimed polders provide additional space for urbanization. While plans to build a given number of villages in each polder were drawn up, most were modified by unpredictable conditions. Modifications included reduction in number of villages created, erection of service centers and shifting of agricultural areas. Thereefore, an 'open plan,' concerned with structure, or 'the way in which the parts are arranged with respect to one another' is used. The plan is not static, and while each part will develop a distinct form, this form will not inhibit future development. Course of development is more important than pinpointing the future. Coordination and communication among those dealing with physical planning is also essential for planning a well balanced environment. (Grden-North Carolina)
W74-05001

AGRICULTURAL ASPECTS,
Netherlands Universities Foundation for International Co-Operation, The Hague.
H. Smits.
Planning and Development in the Netherlands, Vol 4, No 1, p 62-78, 1970. 9 photos, 1 tab.

Descriptors: *Agriculture, *Reclamation, *Land reclamation, Land management, *Farm management, Dikes, Canals, Vegetation establishment, Drainage systems, Crops, Evaporation, Permeability, Land use, Soil management, Soil structure, Soil structure, Soil environment.
Identifiers: *Netherlands(Ijsselmeer polders), Block parcelling system, Soil mapping, Lease holding, Tenant farmers, Cooperative farmers, Land allotment, Marine soils, Agricultural Holding Act, Ministry of Agriculture and Fisheries(Neth).

The agricultural aspects of reclaiming the IJsselmeer polders in the Netherlands are integrated with the drainage process of the polder. A dike is erected, and pumping stations are installed. Reeds are sown to promote evaporation. Over a ten-year period, networks for water channels and roads are laid out, subdividing the land into tracts. Optimum lot size is determined by costs of land use and layout. Reclamation begins two to twelve years later with destruction of reed vegetation and preparation of the soil for sowing. The State then farms the land for five years. During this period, soil is improved, farm dwellings are constructed, and electric and telephone cables are installed. Later, the agricultural destination of the land is determined to be grassland farming, arable farming, mixed farming, fruit growing, or horticulture, depending on the soil profile. Land is then allocated to private enterprises of one to four workers. Size of enterprises have been increasing as technical potential and wages have risen. Enterprises growing vegetables and flower bulbs vary in size from 7.4 to 19.7 acres, fruit growing farms from 14.8 to 37 acres. Land is leased for a term of years or on a perpetual long lease. Enterprises may be sold outright in the future. The relationship between gross yield and costs causes reasonable income to be earned. While farmers may manage their lands as they desire, cooperation between enterprises exists with respect to large farming implements and fertilizers. Financial matters are handled mainly by cooperative farmers loan banks. (Grden-North Carolina)
W74-05002

RECREATION IN THE OPEN AIR,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 6B.
W74-05003

EXPERIMENT IN RAPID LEACHING OF SALINE SOILS IN THE GOLODNAYA STEPPE (OPYT USKORENNOY PROMYVKI ZASOLENNYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 3C.
W74-05018

RHODE ISLAND'S BARRIER BEACHES: VOLUME II. REPORTS AND RECOMMENDATIONS AT THE COMMUNITY LEVEL,
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 2J.
W74-05033

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
For primary bibliographic entry see Field 6E.
W74-05076

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 4B.
W74-05077

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.
W. P. Stokes.
Journal of Petroleum Technology, Vol 23, No 10, p 1209-1214, October 1971. 4 fig, 3 tab, 8 ref.

Descriptors: *Arctic, *Cold regions, Construction, *Road construction, *Alaska, Permafrost, Foundations, Drainage, Thawing, Snow, Wind pressure, Gravels, Piles(Foundation), Buildings, Ice.
Identifiers: *North Slope(Alas), Prudhoe Bay(Alas), Sag River(Alas).

The North Slope of Alaska is located in a continuous permafrost zone where the subsurface soils are permanently frozen to depths as great as 2000 feet. The top foot or so of soil - called the active layer - thaws in summer and refreezes in winter. Permanent road construction requires that the road be built in such manner that the insulating tundra cover is preserved intact and undamaged. Consequently, surface grading and side ditching are ruled out. Culverts are installed above the tundra surface. Adequate quantities of gravel are available in the vicinity of Prudhoe Bay. The gravel should be fairly well graded with sufficient fines to act as a binder; yet it must contain less than 3 percent of material finer than 0.02 mm. A 5-ft.-thick gravel fill usually is adequate, although a somewhat thicker layer may be needed to prevent the thaw from extending into the active zone. Buildings, structures, and other facilities must be designed to meet government regulations and operational requirements. Local conditions of wind velocity and snowfall must be considered. Permanent, heated structures are supported on pile foundations with several feet of free air space under the building. Drill sites are covered with a 5-foot layer of gravel. Skid-mounted rigs are used and the skid rails are supported on timbers to allow circulation of air under the drilling rig. All utility lines that are subject to freezing are protected by insulation, heat tracing, or are placed in heated utilidors. (Gray-NWWA)
W74-05104

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-05107

PROBLEMS IN HYDROLOGIC FORECASTING (VOPROSY GIDROLOGICHESKIKH PROGNOZOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, T.N. Makarevich, editor, Leningrad, 1972. 128 p.

Descriptors: *Hydrology, *Meteorology, *Forecasting, River forecasting, Streamflow forecasting, Flood forecasting, Flood routing, Hydrograph analysis, Discharge(Water), Runoff, Inflow, Reservoirs, Precipitation(Atmospheric), Atmosphere, Air circulation, Temperature, Ice, Seasonal, Correlation analysis, Equations.
Identifiers: *USSR, Heat exchange, Traveltime, Hydrometric stations.

Development of river-forecasting procedures is examined in this collection of 9 papers published by the State Hydrologic Institute in Leningrad. Methods are presented for preparation of long-range forecasts of duration of ice phenomena on the Danube River, severity of winters in Central Europe, maximum ice-jam levels of the Severnaya

Dvina River at Arkhangel'sk, maximum flood levels of the Dniester River, and of storm runoff based on precipitation for the Dnieper River. Procedures are described for estimating inflow to reservoirs and for using precipitation data in the preparation of operational forecasts. (See W74-05142 thru W74-05145) (Josefson-USGS)
W74-05141

LONG-RANGE FORECAST OF DURATION OF ICE PHENOMENA ON THE DANUBE RIVER (DOLGOSROCHNYY PROGNOZ PRODOLZHITEL'NOSTI LEDOVYKH YAVLENIY NA R. DUNAYE),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05142

FORECASTING THE MAXIMUM LEVEL OF ICE JAMS ON THE SEVERNAYA DVINA RIVER AT ARKHANGEL'SK (PROGNOZ MAKSIMAL'NOGO ZATORNOGO UROVNYA VODY R. SEVERNOY DVINY U G. ARKHANGEL'SKA),
Godsudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05144

FORECASTING MAXIMUM FLOOD LEVELS ON THE DNIESTER RIVER (PROGNOZ MAKSIMAL'NYKH PAVODOCHNYKH UROVENY VODY R. DNESTRA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. V. Ardasheva, and R. A. Nezhikhovskiy.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 84-96, Leningrad, 1972. 3 fig. 5 tab, 10 ref.

Descriptors: *Water levels, *Flood forecasting, Flood routing, Channels, Discharge(Water), Flood discharge, Flood waves, Flood peak, Hydrographs, Hydrograph analysis, Inflow, Equations.
Identifiers: *USSR(Dniester River), Traveltime, Hydrometric stations.

To prepare a forecast of maximum flood levels on the Dniester River at Mogilev-Podol'skiy, Soroki, and Kamenka, a precomputed relation was established between these levels and corresponding maximum stream discharges. The forecast is timed to coincide with the onset of the flood peak at Galich and can be made 3-4 days in advance. (See also W74-05141) (Josefson-USGS)
W74-05145

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
R. Cetik.
In: Agricultural spects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p. 109-128. 6 fig, 2 tab.

Descriptors: *Vegetation, *Arid climates, *Arid lands, Geomorphology, Grasslands, Orography, Rain, Rainfall, Temperature, Evaporation, Winds, Precipitation(Atmospheric), Rainfall disposition, Snowfall, Plant groupings, Shribs, Riparian plants, Grazing, Grasses.
Identifiers: *Turkey(Anatolia).

The geomorphology of central Anatolia is described as being diverse, with some mountainous regions and intermountain plains. These plains have an arid climate, caused by the deflection of the moisture-bearing winds of Western Anatolia by the surrounding mountains. Temperature distribution in the area is fairly uniform, with significant low temperature extremes in winter and corresponding high temperature extremes in summer months. Winds are associated with annual cycles, often with two predominant directions. Evaporative water loss from the area is found to be from three to four times in excess of the local precipitation. Central Anatolia has a cold and snowy winter, a mild and rainy spring, a less rainy autumn, and a hot and dry summer with a severe arid period. These climatic conditions are mainly responsible for the floral and vegetation of the central plains. Vegetation may be roughly grouped into classes associated with valleys and the steppe. The more moist environment of the valleys lends itself to shrub vegetation, which is thoroughly cataloged, as is the grassland vegetation of the drier steppe. (Muller-Arizona)
W74-05214

INVASION OF SEMIDESERT GRASSLAND BY VELVET MESQUITE AND ASSOCIATED VEGETATION CHANGES,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3F.
W74-05226

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
For primary bibliographic entry see Field 6F.
W74-05234

EFFECT OF TWO IMPOUNDMENTS ON THE SALINITY AND QUANTITY OF STORED WATERS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 5B.
W74-05335

WATER REGIME OF SOD PODZOLIC SOILS UNDER SPRUCE FORESTS OF DIFFERENT AGES, (IN RUSSIAN),
V. D. Zelikov.
Sb Rab Mosk Lesotekh Inst. 33, p 113-130. 1970.
Identifiers: Ages, *Forests, Moisture, Porosity, Reserves, *Sod podzolic soils, *Spruce, Water regime, Weather, *USSR(Moscow region).

A survey is presented of the mensurative characteristics of spruce stands, soil morphology and weather conditions on the spruce forests in the Moscow region, USSR. The dynamics of replenishment of groundwaters and of the moisture reserves in the soil under the spruce forests, the characteristics of moisture circulation, the dynamics of moisture available to the plants during the growth period, and the changes of soil porosity under spruce forests of different ages are described.--Copyright 1973, Biological Abstracts, Inc.
W74-05343

THE EFFECT OF METEOROLOGICAL FACTORS ON COMBUSTIBILITY OF GROUND COVER AND A NEW METHOD OF FORECASTING FIRE DANGER IN FORESTS OF THE KAZAKH HILLS (IN RUSSIAN),
M. Z. Musin.
Tr Kaz Nauchno-Issled Inst Lesn Khoz. 7. p 309-314, 1970.
Identifiers: *Combustibility, *Fire danger, Forecasting, *Forests, Grass, Ground cover, Hills, Humidity, Meteorological studies, Pine, Temperature, *USSR(Kazakh Hills).

Investigations were made on the effect of precipitation, temperature, relative humidity, and wind velocity on the humidity and combustibility of the ground cover of dying-off needles in pine forests (site class V, age class VI, density 0.5) on a glade with grass cover. The effect of each factor is evaluated by a 3-mark scale. The complex effect of meteorological factors and the appearance of fire sources on the territory under guard are also evaluated by 3-mark scales. Results are presented of experimental verification of different methods of determination of fire danger under the conditions of the Kazakh Hills, USSR.--Copyright 1973, Biological Abstracts, Inc.
W74-05352

DENSE LOCAL PLANTATIONS OF PINES IN THE NORTHERN KAZAKHSTAN (IN RUSSIAN),
V. A. Dikorov.
Tr Kaz Nauchno-Issled Inst Lesn Khoz. 7. p 213-223, 1970.
Identifiers: Moisture, Nutrition, *Pines, Plantations, *USSR(Kazakhstan).

Studies were conducted on pine plantations established in 1939-1962 by seed sowing and seedling planting on small plots from 0.2-0.3 x 0.3 to 3 x 3 m on dry stony soils of the hillocky areas and clearings turned into steppe in the Kustanai, Tselinograd and Kokchetav (USSR) regions. Dense plantations, established by sowing were most practical in places requiring much clearing. Nutrition and moisture reserves were utilized by the biological group (stands) more completely than by single trees. With age, the growth of pine in dense biological groups weakened. Optimum density was 3-5 trees/m2 in a dry pine forest. The spacing of plots at distances of 3 x 5, 5 x 5, 4 x 8 did not result in a stable biocenosis; the size of the plots should not exceed 1 m2, the optimum size being 0.5 x 0.5 m with 1000 plots/ha. Natural root grafting in the biological groups was a frequent phenomenon but it did not affect tree growth. Copyright 1973, Biological Abstracts, Inc.
W74-05354

STUDIES ON RECLAMATION DIKE AT RIVER MOUTH: METHOD OF FORECASTING DISASTER OCCURRENCE AT LAND RECLAMATION BY MEANS OF ESTIMATING INFLUENCE OF SHAPE OF DIKE AND CONFIGURATION SURROUNDING LAND RECLAMATION AREA (IN JAPANESE),
T. Kusaka, T. Fujiwara, and H. Masumoto.
Bull Fac Agric Yamaguti Univ. 23. p 483-49 1972, Illus, English summary.
Identifiers: Configuration, Dikes, *Disas forecasting, *Japan, *Land reclamati Methodology, *Reclamation dikes, Rivers.

Some land reclamation areas studied in Japan w Saga, Kagoshima, Kumamoto, Yamagu Shimane, Tottori and Ibaragi prefectures.--Co right 1973, Biological Abstracts, Inc.
W74-05355

EQUIVALENT PIPE METHODS FOR OPTIM ING WATER NETWORKS--FACTS AND FA LACIES,
Roorkee Univ. (India).
For primary bibliographic entry see Field 8A.
W74-05383

THE ECONOMIC EFFICIENCY OF INTE BASIN AGRICULTURAL WATER TRANSFE IN UTAH: A MATHEMATICAL PR GRAMMING APPROACH,
Water Research Lab., Logan.
J. E. Keith, J. C. Anderson, and C. G. Clyde.
PRWG100-3, Utah Water Research Laborat College of Engineering, Utah State Univers Logan, Utah, June 1973. 51 fig, 16 tab, 40 ref, 5 pend, 136 p.

Descriptors: *Water supply developm *Economic efficiency, *Inter-basin transf *Water allocation(Policy), *Utah, *Agricult *Water demand, Computer models, Optimizat Linear programming, Marginal costs, Value, nicipal water, Industrial water, Wetlands, W requirements, Systems analysis.

Identifiers: *Central Utah Project, Jordan River Basin(Utah).

The efficient allocations of agricultural water in Utah in time frames up to 2020 under several alternative assumptions are examined, and the costs of alternative policies are calculated. Using mathematical programming techniques, a computer model is developed to determine the supply (marginal cost) and demand (value of marginal product) relationships for agricultural water, given depletions for municipal and industrial (M and I) and wetland requirements. The model maximizes net profit per acre to an average agriculturalist in each of ten study areas in Utah. Proposed interbasin transfers and their costs are included in supply. The optimal solution generated is an efficient allocation, since maximization of net profits occurs only when value of marginal product equals marginal cost. Requirements for M and I water are projected into the future, using trending and probable industrial development. Timing of investments in water distribution systems can be determined from the model solutions. Using alternative assumptions about policies, several optional temporal distributions are determined. The effect of restrictions on groundwater pumping is examined. Costs to users in higher supply curves (marginal costs) are approximated by areas between supply curves. Losses to agricultural users from diminished efficient new production can be approximated. The critical factors in large proposed water transfers in Utah appear to be the growth of M and I requirements along the Wasatch Front, particularly in the Jordan River Basin. (Bell-Cornell)
W74-05385

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
R. G. Cembrowicz.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 157-179 (Chapter 7), 1973. 1 fig, 2 tab, 51 equ, 30 ref.

Descriptors: *Water supply development, Projects, *Design, *Optimization, *Alternative planning, *Mathematical models, Cost-benefit analysis, Linear programming, Networks, Hydraulics, Water distribution(Applied), Water treatment, Systems analysis.
Identifiers: *Cost minimization, Geometric programming, Nonlinear programming, Capacity expansion, Unit processes, Tree networks, Decomposition techniques.

The optimal design of water supply systems is considered, with several specific parts of the overall water supply system treated in detail. Inherent difficulties exist in comparing costs of water supply systems to the benefits of ample and safe supply; the problem of a cost-benefit analysis for water supply projects is discussed. Next, if fresh water is scarce or water demands exceed accessible resources, an investigation of all possible supply alternatives in an entire region becomes necessary. Mathematical programming techniques for selecting different sources and the least-cost combination of alternate sources are considered. Next, the focus is on the optimization of unit processes in a water treatment plant; geometric programming is introduced and applied to the hydraulic design of sedimentation tanks. Then, the economically optimal design of the water distribution system is investigated; discussed is the tree principle, and the transformation of the nonconvex capital cost function of a hydraulic network to subsets of nonlinear convex functions by a decomposition position principle from graph theory is described. Finally, a model for the capacity expansion of a water supply system is presented. (Bell-Cornell)
W74-05394

4B. Groundwater Management

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE-GROUNDWATER USAGE--PHASE 1,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, R. A. Young, and G. E. Radosevich.
Available from National Technical Information Service as PB-228 649 $7.50 in paper copy, $1.45 in microfiche. Colorado State University Environmental Resources Center, Completion Report Series No 53, August 1973, 81 p, 3 fig, 3 tab, 53 ref. OWRR B-076-COLO(2).

Descriptors: Groundwater, *Surface-groundwater relationships, *Regulations, Law, *Optimization, *Water management(Applied), *Conjunctive use.

The purpose is to model the legal restrictions and the hydrologic constraints imposed by conjunctive use, and develop criteria for legal rules that utilize information on aquifer parameters, snowmelt runoff, etc. Legal and institutional methods and limitations concerning the conjunctive and integrated use of ground and surface water resources are examined. Legal schemes developed by the states of Colorado and New Mexico for conjunctive use are discussed, together with a cursory examination of the situations in Texas and California. The doctrine of prior appropriation is discussed in relation to its initial development in the western states for the purpose of controlling the appropriation of surface water to its evolution and modification to control conjunctive use. The Colorado system places more stress upon the concept of establishing some common basis for surface and groundwater rights while the New Mexico procedure makes the existence of one dependent upon the retirement of the other. Both systems are characterized by a singular absence of specific requirements; instead broad regulatory powers are created. California has devised a different solution to integrated use due to its complex dual system of water rights. Texas will be faced with a highly complex situation due to adherence to the English rule that a landowner owns the water under his land and cannot be denied the right to produce his groundwater even if it infringes upon neighboring rights. Western states are finally recognizing the need for integrated use of ground and surface water; the Fellhauer case required the integration of vested rights with maximum utilization.
W74-04853

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
K. E. Vanlier, R. C. Christensen, R. J. Faust, and W. F. Harris, Jr.
In: Geological Survey of Alabama Atlas Series 1, p 13-28, 1971. 13 ref.

Descriptors: *Water resources, *Alabama, Groundwater, Surface waters, Urbanization, Karst hydrology, Water demand, Water supply, Geology, Maps.
Identifiers: *Huntsville(Ala).

The demands of the increased population upon the natural resources of Madison County, Alabama, are at an all-time high; so is the volume of waste produced. Informed use of the land, water, and mineral resources, based on scientific facts, is necessary for Alabama's third-largest urban area and its environs. This study has been directed at supplying basic facts about the resources of the area and their conservation to aid in adequate city and urban planning for the future. Water, oil and gas and minerals such as limestone, sand, gravel, and clay for construction are the most important raw materials for industrial development in the area. In general, Alabama has great and unexplored reserves of these resources that are relatively undeveloped. In Madison County, a thick sequence of limestone beds underlie the area. Some of these formations are relatively pure limestone that has been gently folded and fractured. Fracture openings in limestones are enlarged by solution, forming large storage reservoirs underground for water and an extensive labyrinth of channels along which groundwater can move. These groundwater reservoirs, when tapped effectively by wells and managed properly, are capable of supplying many billions of gallons of water to the area to meet its water needs. Wells are an important source of water supply. The yields from these wells range from about 5 to more than 100 gpm. Most wells in the quadrangle supply household needs, which require only a few gallons per minute. Several wells yielding 100 gpm or more are used for industrial, agricultural, and public supply. (Knapp-USGS)
W74-04911

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
E. S. Davidson.
Arizona Water Commission Bulletin 6, December 1973. 40 p, 4 fig, 2 tab, 17 ref.

Descriptors: *Water resources, *Arizona, *Groundwater, *Surface waters, Alluvial channels, Hydrologic data, Hydrogeology, Aquifers, Water yield.
Identifiers: *Big Sandy River(Ariz).

The central valley of the Big Sandy River, Arizona, is underlain by several hundred to a few thousand feet of semiconsolidated to unconsolidated deposits that store large amounts of groundwater; the principal water-yielding units are stream and flood-plain alluvium, the upper basin fill, the lower basin fill, and the arkosic gravel. The depth to groundwater below the land surface ranges from less than 1 foot in places along the Big Sandy River to 750 feet in the northern part of the area. The mean annual precipitation ranges from 10 inches in the central valley to 20 inches in the mountains and is equivalent to about 1 million acre-feet of water in the 1,770-square-mile drainage basin of the Big Sandy River upstream from the granite gorge near Wikieup. About 4.6% of the precipitation leaves the area as surface-water and groundwater outflow; the rest of the precipitation is lost to evaporation or is transpired by vegetation. In general streamflow is intermittent and occurs only in response to precipitation or snowmelt. Groundwater and surface water generally are of good chemical quality except for the high fluoride content. The average surface-water outflow is about 24,900 acre-feet per year. The total groundwater outflow--which comprises evapotranspiration in an area of dense riparian growth, consumptive use for irrigation and public supply, and underflow--is about 21,500 acre-feet per year. Only a few thousand acre-feet of water per year is used by the inhabitants in the area, and the available water resources will support considerable additional development. (Knapp-USGS)
W74-04922

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-04973

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. S. Gates.

Available from the National Technical Information Service as PB-228 854, $15.00 in paper copy, $1.45 in microfiche. Technical Report No. 8, June 1972. 214 p, 11 fig, 16 tab, 40 ref, append. OWRR B-007-ARIZ(26) and A-010-ARIZ(22). 14-01-0001-1876, 14-31-0001-3708.

Descriptors: *Groundwater, *Computer models, Recharge, Statistical models, *Forecasting, Network design, *Risks, *Well data, Pumping.
Identifiers: Bayesian decision theory, Groundwater pumping, Model evaluation, Uncertainty analysis.

The worth of additional data to a digital model of the Tucson basin, Arizona was computed using a basic form of statistical decision theory (Bayesian). The model variables for which additional data were hypothesized included the aquifer coefficients of storage and transmissivity, initial water levels, discharge, and recharge. The worth of data was evaluated in terms of the expected reduction in error in predicted water levels associated with collection of more data on one variable at one point in the model. A limited number of tests suggested that the Tucson basin model could be improved most by obtaining more data on discharge and recharge in areas where these variables were large, and by obtaining more data on transmissivity where it was uncertain. More data on initial water levels and storage coefficient commonly were less helpful. The sensitivity of the results to the assumptions made in postulating discrete frequency distributions with largely subjectively-determined parameters for the model variables was estimated. These tests indicated that the numerical values for worth of data were sensitive to the assumptions, but that the relative rankings of variables in terms of worth of added data remained constant.
W74-04975

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-04976

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
S. Garza.
Texas Water Development Board, Report 34. November, 1966. 31 p, 11 fig, 4 tab, 33 ref.

Descriptors: *Aquifer characteristics, *Limestones, Surface-groundwater relationships, Water sources, Water table, Saline water intrusion, Reservoirs, Streams, Wells, *Texas.
Identifiers: *Edwards Aquifer(Tex.), *San Antonio(Tex.), Aquifer head-water movement relationships, Edwards Plateau(Tex.).

This report updates through 1964 hydrologic data on the Edwards and associated limestones, which is the principal ground-water reservoir (aquifer) for the San Antonio area. Records of precipitation, streamflow, and water level are included, as well as estimates of recharge to and discharge from the aquifer. The base flow of the streams that drain the Edwards Plateau is spring flow from a water-table aquifer in the plateau. Recharge is primarily from stream seepage, and through direct infiltration of precipitation on the outcrop of the aquifer. Between 1934-1964, average annual recharge was estimated to be almost 500,000 acre-feet. Most of the 1934-1964 discharge from the aquifer was from springs, exceeded by discharge from wells only between 1954-1957 and 1963-1964. In 1964 discharge from springs was nearly 214,00 acre-feet, while discharge from wells exceeded 267,000 acre-feet. Low water levels prevailed between 1947-1956, due to drought and increased withdrawals from wells throughout the San Antonio area. Recharge from heavy rains between 1957-1961 increased water levels to approximately pre-drought levels. Also included are analyses on the relation of the aquifer head to changes in water movement and storage and a summary of studies on water quality in the zone of transition between water of good quality and saline water in the aquifer. (Hoffman-North Carolina)
W74-04992

FUNDAMENTALS OF KARST SCIENCE. VOLUME 2 (OSNOVY KARSTOVEDENIYA. TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.
For primary bibliographic entry see Field 2F.
W74-05017

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
E. G. Woods.
Society of Petroleum Engineers Journal, Vol 10, No 3, p 245-256, September, 1970. 12 fig, 5 tab, 15 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Aquifer characteristics, *Mathematical models, Diffusivity, Drawdown, Flow Permeability, Porosity.
Identifiers: *Pulse test, *Well pair, *Two-zone reservoir, Cross flow, Skin factor, Buildup.

A mathematical study was undertaken to determine what errors could be caused by interpreting pulse tests in a multi-zone reservoir with a single-layer model. The investigation of the pressure response of two-zone reservoirs indicates the apparent transmissibility obtained by pulse testing is always equal to or greater than the total transmissibility of the zones. Apparent storage is always equal to or less than the total storage of the zones. These apparent zone properties approach total properties as vertical fluid communication between zones increases. The presence of non-uniform wellbore damage in the zones alters the division of flow between zones, and consequently, alters their apparent transmissibility ratio. The flow-rate ratio is a good estimator of the transmissibility ratio of the zone in the absence of wellbore damage. A numerical example is given of the use of a procedure, based on the differences of reservoir properties determined by single-well tests and pulse tests, to describe flow properties of two-zone reservoirs. (Gray-NWWA)
W74-05077

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05078

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
D. J. Swaine.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 5 p, 4 ref.

Descriptors: Groundwater, *Groundwater movement, *Geochemistry, *Trace elements, Chemical properties, Exploration, Mining, *Water quality, Salinity, Organic wastes, Solid wastes, *Sulfur bacteria, *Australia.
Identifiers: Perth(Aust.), Interstitial water.

The assumption is made that groundwater is a resource which will be used in increasingly large amounts in the future. There is at present insufficient knowledge of the trace-element composition of the processes determining the composition; and of the causitive physical and chemical processes of underground waters. Discussed in some detail are: Origin of salts in groundwater, reactions between rocks and saline solutions, the relevance of underground waters to mineral exploration, and groundwater in the geochemical cycles of trace elements. Also discussed are processes which if operative could be instrumental in determining groundwater quality, such as the decomposition of organic matter and the action of sulphate-reducing bacteria. (Hunt-NWWA)
W74-05080

PUBLIC CONTROL AND REGULATION,
Melbourne Univ., Parkville (Australia).
For primary bibliographic entry see Field 6E.
W74-05082

GROUNDWATER IN PAPUA NEW GUINEA,
Geological Survey of Papua New Guinea, Port Moresby.
G. Jacobson, and C. H. Kidd.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 16 p, 6 fig, 1 tab, 8 ref.

Descriptors: *Groundwater, *Aquifer characteristics, Water resources development, Springs, Wells, *Groundwater availability, Dug wells, *Water pollution sources.
Identifiers: *Papua New Guinea, Total dissolved solids, Bacterial contamination.

Groundwater makes a significant contribution to the urban and rural water supplies of Papua New Guinea. Eight hundred water bores and dugwells have been recorded, and there are spring developments throughout the country. Increased future usage of groundwater is necessary because of bacterial contamination of surface waters and the seasonal nature of the rainfall in some areas. Groundwater availability is largely unknown, and the need for reconnaissance surveys and detailed aquifer evaluations is discussed with the aid of a groundwater potential map. Finance is at present a major limiting factor to groundwater development with government drilling programs appearing to be the only workable solution. (Staplin-NWWA)
W74-05084

PRESSURE INTERFERENCE EFFECTS WITHIN RESERVOIRS AND AQUIFERS,
Standard Oil Co. of California, San Francisco.
T. D. Mueller, and P. A. Witherspoon.
Journal of Petroleum Technology, Vol 17, No 4, p 471-474, April, 1965. 4 fig, 5 ref.

Descriptors: *Aquifers, Groundwater reservoirs, *Diffusivity, *Reservoirs, *Pressure, Flow, Head loss, Theis equation.
Identifiers: *Mortada equation, Point source, Well interference.

The solutions of Theis and of Mortada to the Calculation of pressure conditions within a reservoir or aquifer are reviewed. Graphs were prepared of dimensionless pressure drop vs. dimensionless time for radius ratios from one to infinity to afford solutions to the diffusivity equation for the infinite radial case at constant terminal rate. The Theis, point source, solution can be used for radius ratios greater than 20, with little error (as shown by

amples). For low radius ratios, the solution of the diffusivity equation given may be preferred. A chart provides a means of determining the order of the errors that will result through the use of the Theis equation. In the calculation of interference effects in an aquifer, a substantial error can occur when the Theis solution is used, although in oil-reservoir calculations the error is often negligible. (Gray-NWWA)
W74-05087

THE SKIN EFFECT IN PRODUCING WELLS,
For primary bibliographic entry see Field 8B.
W74-05088

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
For primary bibliographic entry see Field 5B.
W74-05100

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
W. S. Keys.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commision, p 46-73, 1973. 6 fig, 1 tab.

Descriptors: *Borehole geophysics, *Data collections, Hydrologic data, Hydrogeology, Electrical well logging, Radioactive well logging, Subsurface investigations.

Borehole geophysics or well logging includes all techniques of lowering a sensing device in a well to make a record which may be interpreted in terms of the rock characteristics, contained fluids, and the construction of the well. The single most important factor in the present minor use of geophysical logging in water wells in cost. As a result of recent developments in electronics, small and relatively inexpensive logging units that can be operated by one man are now available. A second basic deterrent to the widespread use of geophysical well logs in groundwater is that few professional geologists, hydrologists, or engineers are working on water well drilling projects. In addition, most drillers, municipal water engineers, or hydrologists do not have the experience necessary to interpret geophysical logs. Therefore interpretation must be provided along with logs, if logging is to have much practical application to the solution of hydrologic problems. (Knapp-USGS)
W74-05118

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
A. N. Turcan, Jr.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commission, p 18-28, 1973. 3 tab, 8 ref.

Descriptors: *Data collections, *Hydrologic data, *Hydrogeology, Water resources development, Planning, Water management(Applied), Conferences, *Groundwater managment.

In design and evaluation of a groundwater data system, thinking must not be limited to one part of the hydrologic system. The line between ground and surface water is indistinct; it is not a line, but a continuum that varies in relation to time and space. Groundwater becomes surface water and vice versa. The hydrologic system is dynamic, thus network design must be flexible and always subject to change based upon the changes in economy, available manpower, and new thrusts or problems, such as storage of waste in the deep zones as well as the shallow zones of the underground part of the system. (Knapp-USGS)
W74-05119

COLLECTION OF GROUNDWATER DATA,
Georgia Inst. of Tech., Atlanta.
P. G. Mayer.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commission, p 12-17, 1973.

Descriptors: *Data collections, *Hydrologic data, *Hydrogeology, Water resources development, Planning, Water management(Applied), Conferences, *Groundwater management.

A local data base is needed for groundwater development as well as an appreciation of regional implications that may exist either as limiting to the desired engineering results or as an undesirable consequence of an engineering project. The usual purposes to which engineers and planners address themselves in connection with groundwater resources are water supply wells, infiltration galleries, groundwater recharging wells, and infiltration ponds. In larger industrial developments it may also be necessary to develop groundwater observation wells and groundwater monitoring systems, by means of which the fate of potential pollutants can be monitored and which, in the case of an unforeseen accident, provide the basis for remedial measures. (Knapp-USGS)
W74-05120

GROUNDWATER CONDITIONS OF THE TARAI REGION,
Pant Coll. of Tech., Pantnagar (India).
A. K. Bhar, H. S. Seth, and A. K. Ghosh.
Indian Geohydrology, Vol 9, No 1, p 19-30, June 1973. 1 fig, 3 tab, 6 ref.

Descriptors: *Water balance, *Groundwater, *Water yield, Irrigation water, Infiltration, Discharge(Water), Water resources development, Hydrogeology, Artesian aquifers, Water table.
Identifiers: *India(Tarai region).

In the groundwater of the Tarai region of India, every year a surplus of water accumulates in the upper unconfined aquifers, whereas the inflow to the confined aquifers just balances the outflow from them. This suggests that further exploitation of water from confined aquifers should be stopped at least for the time being, and additional water required for irrigation can be safely tapped from the unconfined aquifers. (Knapp-USGS)
W74-05131

SPACING OF HARD ROCK SHALLOW WELLS,
Osmania Univ., Warangal (India). Regional Engineering Coll.
N. T. Zhdankus.
Indian Geohydrology, Vol 9, No 1, p 1-9, June 1973. 2 fig, 4 ref.

Descriptors: *Water wells, *Water yield, *Hydrogeology, Economics, *Water costs, Hydraulic conductivity, Transmissivity, Data collections.
Identifiers: *India.

Optimum spacing and number of wells depend on hydrogeological conditions. Suitable methods for the determination of optimum spacing of shallow hard rock wells and selection of suitable pumps for them were developed on the basis of hydraulic and economical considerations. Shallow aquifers in hard rock areas of India are characterized by low hydraulic conductivity and transmissivity. Location of each well should be determined individually on the basis of geophysical data and interpretation of local topographical and geological conditions. Sharp variation of productivity of even closely situated wells in hard rock areas shows that hydrogeological parameters of such formations are inconsistent, varying within broad limits without any pronounced order. (Knapp-USGS)
W74-05133

GEOTHERMAL RESOURCE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: SPECIAL REPORT TEST WELL MESA 6-1.
Bureau of Reclamation, Denver, Colo. Lower Colorado Region.
February 1973. 44 p, 17 fig, 3 photo, 7 tab, 3 ref.

Descriptors: *Geothermal studies, *Water wells, Thermal water, *California, Thermal powerplants, Water yield, Wells.
Identifiers: *Geothermal energy, *Imperial Valley(Calif).

The Bureau of Reclamation and the Office of Saline Water are exploring the geothermal resources under Reclamation-withdrawn lands in Imperial Valley, California. A deep geothermal test well was drilled in Imperial Valley, California. Total depth of 8,030 feet was reached on August 16, 1972. The well began to flow geothermal liquid and steam on August 25, 1972 and flowed for an aggregate total of 66 days to January 24, 1973. A series of temperature, pressure, quality, and flow measurements were made during that period. Surface plumbing facilities, including a separator, silencer, and weir, were installed to separate the steam and liquid and to accurately determine the thermodynamic characteristics of the geothermal fluid. The water is typical geothermal fluid. It is predominantly sodium-potassium and chloride water, with the amount of silica being at the saturation point for the prevailing temperature. In the interval between 2,500-7,150 feet in Mesa 6-1, it would be possible to screen potential producing zones having intergranular permeabilities in excess of 100 millidarcys over an aggregate thickness of 1,232 feet. (Knapp-USGS)
W74-05139

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
Publication No 20, 1973. 58 p, 32 fig, 10 tab, 15 ref, 3 append.

Descriptors: *Conjunctive use, *Hydrogeology, Aquifer characteristics, Aquifer testing, Water yield, Drawdown, Surface-groundwater relationships, Water balance.
Identifiers: *Wales(Vale of Clwyd).

The hydrogeology of the Vale of Clwyd, Wales, and the relationship between the surface hydrology and groundwater conditions are described. Up to 20,000 cu m per day could be made available by continuous direct supply from boreholes, but any such perennial abstraction would in the long term reduce flows in the river Clwyd; at least 30,000 cu m per day could be made available for supply if the groundwater storage were to be used to regulate the river Clwyd, and such a development would enhance the low flows in summer and autumn over much of the river. (Knapp-USGS)
W74-05168

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
R. F. Norvitch, T. G. Ross, and A. Brietkrietz.
Metropolitan Council of the Twin Cities Area, St. Paul, 1973. 219 p, 59 fig, 27 tab, 64 ref, append.

Descriptors: *Groundwater, *Hydrogeology, Aquifer characteristics, *Minnesota, Hydrologic data, Aquifers, Water resources development, Cities, Water management(Applied), Water wells, Water yield, Urbanization.
Identifiers: *St. Paul(Minn), *Minneapolis(Minn).

The water resources of St. Paul and Minneapolis were studied within an area whose natural groundwater flow is largely towards the center of the

metropolitan area. This area coincides with the extent of the Hinckley Sandstone aquifer. Greater emphasis is placed on the area underlain by the Prairie du Chien-Jordan aquifer (about 2,000 square miles), from which approximately 75% of the groundwater for the metropolitan area is pumped. The surface-water resources of the Twin Cities metropolitan area are used to such an extent that a supply adequate for domestic and industrial needs as well as powerplant and sanitary effluent assimilation will not be available during severe drought. Groundwater is obtained primarily from two aquifer systems: The Prairie du Chien-Jordan and the Mount Simon-Hinckley. In 1970, these aquifers supplied about 90% (175 mgd) of the groundwater used in the metropolitan part of the study area. The probable level of development that can be sustained by these two aquifers in the metropolitan area is estimated to be 1,100 mgd; thus, substantial additional groundwater supplied could be developed. However, considerable management and planning would be needed to sustain this level of development. Maps in this report can be used to select general well-field locations based on consideration of (1) aquifer, (2) depth needed for completion, (3) head availability, (4) location of natural recharge and discharge boundaries, and (5) distance from areas where over-development of groundwater resources is imminent. (Knapp-USGS)
W74-05172

SUBSURFACE BIOLOGICAL ACTIVITY IN RELATION TO GROUND WATER POLLUTION,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W74-05230

GROUNDWATER IN THE NORTHERN WISO BASIN AND ENVIRONS, NORTHERN TERRITORY,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
M. A. Randal.
Bulletin 123, 1973. 141 p, 23 fig, 1 plate, 15 tab, 65 ref, 7 append.

Descriptors: *Groundwater, *Hydrogeology, *Australia, *Aquifers, Water yield, Geomorphology, Water quality, Groundwater movement.
Identifiers: Wiso Basin(Australia).

Groundwater resources were studied in the northern Wiso Basin in the central part of the Northern Territory of Australia. Because of seasonal and sparse rainfall the surface water resources of the region are meager, and both pastoral and community development are largely dependent on the availability of groundwater of reasonable quality. The region comprises three Palaeozoic basins of mainly carbonate rocks and their surrounding Lower Cambrian and Precambrian basement rocks. From a groundwater point of view the most important of the basement rocks are Lower Cambrian volcanics, which crop out in the west and extend subsurface considerable distances eastward. Most of the groundwater is obtained from the carbonate sequences. Over large parts of the region these sequences are overlain by flat-lying Lower Cretaceous rocks which have a profound effect on the groundwater regime. Geomorphology also is important to the groundwater regime. The region is a gently undulating plateau which slopes northward and is bounded by the dissected country of the main coastal river system; depth to economic quantities of water is governed by the depth below the surface of suitable aquifers, and throughout the plateau these are generally deeper than on its dissected margins. Throughout the entire region the known groundwater reserves are suitable for stock; only in a few places is the quality below domestic standards. The groundwater resources are more than adequate for the present pastoral and community development. Although rainfall is low in the southern parts the probable recharge areas are very large and the withdrawal rate is very low. In the north rainfall is high and recharge situations extensive. (Knapp-USGS)
W74-05331

EXTENSIVE PUMPING FROM UNCONFINED AQUIFERS,
Birmingham Univ., (England). Dept. of Civil Engineering.
K. R. Rushton.
Water Resources Bulletin, Vol 10, No 1, p 32-41, February 1974. 5 fig, 2 tab, 5 ref.

Descriptors: Water resources development, *Water yield, *Groundwater movement, *Numerical analysis, Drawdown, *Withdrawal, Mathematical models, Water table, Recharge, *Pumping.

Heavy pumping of an aquifer to remove a significant proportion of the stored water is considered using a numerical method which permits the analysis of radial flow to a well in an unconfined aquifer and allows for the reduction in the saturated depth. The analysis is restricted to extensive unconfined aquifers of constant thickness which are initially full of water with wells positioned on a square grid. When the aquifer is recharged with the recharge equaling the discharge, it is possible that a steady state will be reached with the heads remaining constant with time. Withdrawal of a large proportion of the available water from an unconfined aquifer requires carefully controlled pumping. If the discharge rate is too high, the pump will quickly run dry and only a very small proportion of the water will be withdrawn. (Knapp-USGS)
W74-05336

4C. Effects On Water Of Man'S Non-Water Activities

EFFECT OF WATERSHED AREA OIL FIELDS ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
For primary bibliographic entry see Field 5B.
W74-05079

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.
For primary bibliographic entry see Field 4A.
W74-05104

4D. Watershed Protection

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
Copy available from GPO Sup Doc as EP1.23:430/9-73-016, $2.20; microfiche from NTIS as PB-229 480 $1.45. Environmental Protection Agency, Washington, D.C., Office of Water Program Operations, Report EPA-430/9-73-016, July 1973. 205 p, 60 fig, 140 ref. EPA Contract 68-01-0755.

Descriptors: *Erosion control, *Sediment control, *Comparative costs, *Construction costs, *Soil erosion, *Estimated costs, Erosion rates, Cost analysis, Rainfall intensity, Water pollution, Water pollution sources, Water clarification, Soil conservation, Dredging, Desilting, California, Virginia.
Identifiers: *Universal soil loss equation, Occoquan Creek Basin(Virginia), Walnut Creek Basin(California), Rainfall erodibility index, Debris basins.

Cost information on erosion and sediment control measures was developed for over 25 methods in current widespread use in both the humid Eastern and arid Western United States. Most of the data presented were developed for the Walnut Creek Basin in California and the Occoquan Creek Basin in Virginia, but the detailed cost estimates presented provide a basis for estimating local costs elsewhere for similar control methods using three principal cost elements: labor, equipment and materials. Soil losses were estimated by using the improved universal soil loss equation. The rainfall erosion index in the soil loss equation was intensively studied, and simplified procedures for its computation were developed and presented. Cost data were applied to theoretically-predicted soil losses in both of the selected watersheds to obtain comparative costs per cubic yard of soil retained for conservation measures, and similar costs for various sediment removal methods. Control effectiveness parameters and economic life of each method were used to determine comparable annual cost figures. A central conclusion of the study was that costs of preventing erosion are, in many instances, lower than the direct costs of removing sediments from downstream areas or from water supplied. (EPA)
W74-04986

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
Prepared for the Town of Greenwich, Connecticut, May, 1973. 22 p, 14 fig.

Descriptors: *Water supply, *Connecticut, *Conservation, Environmental effects, *Watershed management, Planning, *Water demand, Ecology, Geology, Hydrology, Soils, Connecticut, Urbanization, Zoning, Natural resources.
Identifiers: Open space, *Greenwich(Conn.), Natural processes.

Part of the town of Greenwich which is of vital concern in terms of protection from urban development pressures is the water supply watershed representing most of the remaining open area within the town. The aqueduct from the Mianus River Reservoir in Stamford is the other major source of water. Intended to provide information needed to make recommendations and decisions concerning the use and development of this area, this study focuses on a corridor of wetlands and streams within the watershed and covers bedrock geology, surficial geology, ecology, hydrology, and soils. Emphasis is placed on identifying natural conditions and processes and the interrelationships among these processes or environmental subsystems. The findings of the study are grouped according to those relating to water supply, to water demands, and to the protection of resources. The town's demand for water has increased 50% in the past 10 years and the watershed, especially the central corridor, is a critical element in meeting the demand. It is proposed that in the central corridor area no residential development be allowed on poor soils, on steep slopes, or within 200 feet of streams, lakes and wetlands. Recommendations include the use of zoning ordinances, the State Inland Wetlands Act, and the Town Plan. (Elfers-North Crolina)
W74-04996

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF

ROZEN SOIL AND ON EROSION PROCESSES
'LIYANIYE LUNKOVANIYA ZYABI NA
ODNO-FIZICHESKIYE SVOYSTVA MER-
LOY POCHVY I PROTSESSY EROZII),
or primary bibliographic entry see Field 2G.
'74-05019

ROSION CONTROL AND VEGETATIVE
OVER UNDER DRYLAND CONDITIONS IN
URKEY,
tanbul Univ. (Turkey). Faculty of Forestry.
or primary bibliographic entry see Field 3F.
'74-05220

HE HYDROMETEOROLOGICAL AND AN-
IEROSION EFFECT OF FORESTS IN THE
ASTERN PART OF THE CENTRAL URALS
N RUSSIAN),
. A. Kharitonov.
esovedenie. 6. p 14-24, 1970, English summary.
entifiers: *Erosion control, Forests, Freezing,
anagement, Meteorological conditions, Runoff,
ow, Soils, *USSR(Central Urals), *Montane
rests.

ne effect of the montane forests on elements of
e local climate along the watersheds and moun-
in slopes is discussed. The effects on the snow
gime, the freezing and defreezing of soil, the
rface runoff and the river runoff are described.
dexes of the anti-erosion effect of forest, and
ivicultural measures for the intensification of the
drometeorological effect of forests in the east-
n part of the Central Urals, USSR, are
esented.--Copyright 1973, Biological Abstracts,
c.
'74-05353

WATER QUALITY MANAGEMENT AND PROTECTION

A. Identification Of Pollutants

RACE SOLUABLE ORGANIC COMPOUNDS
I POTABLE WATER SUPPLIES,
wa State Univ., Ames. Dept. of Chemistry.
. J. Svec, J. S. Fritz, and G. V. Calder.
vailable from National Technical Information
ervice as PB-228 523 $4.50 in paper copy, $1.45 in
icrofiche. Iowa Water Resources Research In-
itute, Ames, Report ISWRRI - 54, January 1974.
p, 2 fig, 3 tab, 11 ref. OWRR A-046-IA(1).

escriptors: *Organic compounds, Aqueous solu-
ons, *Potable water, *Analytical techniques,
esins, *Solvent extractions, Gas chromatog-
phy, *Water analysis, Mass spectometry, Iowa,
ebraska.
entifiers: Macroreticular resins, *Trace organic
alysis.

n analytical method has been developed for con-
ntrating, extracting, separating, and identifying
tural organic compounds present in sub parts-
r-million quantities in potable water. The
veloped technology consists of extracting trace
ganic compounds from water by means of
acro-reticular resins, eluting them by simple and
pid solvent methods, separating the mixtures by
s chromotography, and identifying and quantify-
g the various pollutants by combination gas
romotography mass spectometry. The experi-
ental XAD-2 method was compared to the stan-
rd EPA approved solvent extraction method for
termining chlorinated pesticides in water and
owed it to be more effective, even at parts-per-
illion levels, in recovering dieldren from river
ater. More than 150 compounds were identified
n about half of these cases even the specific
omer was identified) in the raw and/or treated
ater from fifteen Iowa and Nebraska communi-
es. In several cases the raw water had fewer con-
taminants than the treated water. Presumably the additional contamination resulted from contact with treatment equipment or organic coatings (tar or asphalt) used to prevent corrosion of the iron conduits used to transport the water to consumers. (Cecil-Iowa)
W74-04855

SELECTIVE CHROMATOGRAPHIC SEPARATION OF URANIUM(VI) ON DEAE-CELLULOSE LAYERS IN DILUTE ACETIC ACID MEDIA,
Chiba Univ. (Japan). Lab. for Analytical Chemistry.
R. Kuroda, K. Oguma, and H. Watanabe.
Journal of Chromatography, Vol 86, No 1, p 167-172, November 1973. 1 fig, 2 tab, 19 ref.

Descriptors: *Cellulose, *Separation techniques, Ions, Acids, Chromatography, Beryllium, Magnesium, Aluminum, Calcium, Titanium, Chromium, Zinc, Cadmium, Manganese, Iron, Cobalt, Nickel, Copper, Strontium, Lead, Molybdenum, Gold, Mercury, Ion exchange.
Identifiers: *Uranium, *Thin layer chromatography, Acetic acid, DEAE-cellulose, Indium, Vanadium, Gallium, Ruthenium, Scandium, Barium, Yttrium, Thallium, Thorium, Zirconium, Tin, Antimony, Tellurium, Bismuth, Rhodium, Arsenic, Germanium, Columbium, Silver, Tungsten, Iridium, Rhenium, Platinum, Selenium, Elution.

In dilute acetic acid solutions, U(VI) shows a useful chromatographic distribution on DEAE-cellulose layers, while most other metals ions migrate upwards to the solvent front or remain at or near the start. This chromatographic behavior of U(VI) enables a selective method for the separation of U(VI) by thin-layer chromatography to be developed. The R sub f values on DEAE-cellulose and Avicel SF are quoted for 34 metal ions as a function of acetic acid concentration in the range 1-6 M. Results for two- and three-component separations by elution with 1 M acetic acid are given in order to illustrate the effectiveness and utility of the present method. (Mortland-Battelle)
W74-04864

IDENTIFICATION OF AROMATIC NITRILES BY REACTION PAPER CHROMATOGRAPHY,
Vyzkumny Ustav Organickych Syntez, Pardubice (Czechoslovakia).
J. Franc, and K. Pospisilova.
Journal of Chromatography, Vol 86, No 1, p 159-165, November 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Chromatography, *Aromatic compounds, Acids, *Organic acids, *Pollutant identification, Organic compounds.
Identifiers: *Nitriles, *Paper chromatography, Dinitriles, Diamides, Carboxylic acid, Cyanobenzoic acid, Dicarboxylic acid, Tricarboxylic acid.

A procedure involving reaction paper chromatography for the determination of the number of nitrile groups in molecules from the shift in the R sub M values of the substance before and after reaction has been developed. A technique for the detection of substances with a nitrile group, which can be used with advantage even for other substances, has been devised. To 1 ml of 15-20 percent hydrogen peroxide, 1-2 drops of 15 percent aqueous NaOH solution and several milligrams of a sample of a substance containing a nitrile group were added. The mixture was shaken and filtered after 2-3 min, and the residue on the filter was dissolved in either dimethyl sulphoxide or ethanol. The solution obtained was applied directly on to the chromatographic paper as a 5 percent solution. The substances were chromatographed on Whatman No. 3 paper using n-propanol-ammonia (2:1) as the solvent. The detection was carried out by spraying with two reagents. The first reagent was prepared by mixing 5 g of hydroxylamine hydrochloride with an equivalent amount of anhydrous sodium carbonate and adding 200 ml of 96 percent ethanol. After stirring, the solution was filtered and the filtrate was used for spraying. The second reagent was a saturated aqueous solution of copper(II) acetate. The chromatogram was sprayed with the first reagent and, after drying either freely in the air or in an oven at 80C, it was sprayed with the second reagent. The coloration of the spots was observed immediately under UV light. Some substances fluoresced brightly in various colors, and some were visible even under normal light. (Mortland-Battelle)
W74-04865

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
M. L. Fishman, L. M. Landgraff, and D. Burdick.
Journal of Chromatography, Vol 86, No 1, p 37-51, November 1973. 5 fig, 10 ref.

Descriptors: *Amino acids, *Chemical analysis, *Data processing, Interfaces, Electronic equipment, Costs, Instrumentation, Automatic control.
Identifiers: *Data interpretation, Automatic amino acid analyzer, Programmable electronic calculator, Chemical recovery, Kjeldahl nitrogen.

The rapid calculation of data from an automatic amino acid analyzer by a programmable electronic calculator is now possible. The programmable electronic calculator offers a less expensive and more flexible alternative to large computers. Typically, data in the form of retention times and peak areas are read from a punched tape and converted into final values with a minimum of data handling. A digital integator, teletypewriter with tape punch and reader, tape editor and printer also are required. A mathematical program is described that has been devised to convert raw data from a 4-h protein hydrolyzate run into final values. The final printout presents in tabular form each amino acid as a percentage of the sample dry weight and crude protein. The total weight percentage of amino acids and percentage recovery of protein based on Kjeldahl nitrogen are also calculated. Other features of the program include the ability to eliminate up to 20 extraneous peaks from the sample and to correct for sampling errors with the aid of internal standards. Amino acid molecular weights and color constants, which are also calculated, are stored without destruction so as to permit the calculation of an unlimited number of samples from the same set of standards. (Holoman-Battelle)
W74-04866

COULOMETRIC DETERMINATION OF IRON(II)-1,10-PHENANTHROLINE WITH CERIUM(IV),
Maryland Univ., College Park. Dept. of Chemistry.
S. W. McClean, and W. C. Purdy.
Analytica Chimica Acta, Vol 67, No 1, p 113-118, November 1973. 2 tab, 8 ref.

Descriptors: *Iron, *Electrochemistry, *Pollutant identification, Methodology, Chemical analysis, *Volumetric analysis, Heavy metals, Electrodes.
Identifiers: *Coulometric titration, Cerium, *Ferroin, Precision, Accuracy, Metal complexes, 1 10-Phenanthroline, Chemical concentration, End-point detection system.

Iron bound to 1,10-phenanthroline (ferroin) was determined by coulometric titration with electrogenerated cerium(IV). Titrations were performed in which generation was stopped from 1 min after about 80 percent of the sample had been titrated. No significant differences were observed between these titrations and those run with no delay. Those iron samples in the range 0.1-130 micrograms were titrated with a relative standard deviation of 0.7-5.0 percent and a relative error of

0-4.0 percent with the greatest inaccuracies and imprecision being at the lower end of the range, where titration times were shortest. The end-point detection system consisted of a platinum and a saturated calomel electrode across which a constant voltage is impressed. This voltage is such that the platinum electrode is 1.025 V vs N.H.E. The current between the indicating electrodes is monitored with a current-sensing device possessing a sensitivity of 0.0001 microA/mm. (Holoman-Battelle)
W74-04867

DETERMINATION OF EIGHT METALS IN THE INTERNATIONAL BIOLOGICAL STANDARD BY FLAMELESS ATOMIC-ABSORPTION SPECTROMETRY,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
P. Schramel.
Analytica Chimica Acta, Vol 67, No 1, p 69-77, November 1973. 10 fig, 3 tab, 6 ref.

Descriptors: *Trace elements, Calcium, Potassium, Sodium, Phosphorus, Aluminum, Cadmium, Copper, Chromium, Iron, Manganese, Lead, Sulfur, *Metals, Pollutant identification, *Spectrophotometry.
Identifiers: Flameless atomic absorption spectrophotometry, *Biological samples, Wet ashing, Human tissue, Vanadium, Tissue, Muscle, Plancenta, Sample preparation, Chemical interference.

Flameless atomic-absorption spectrometry was used to measure the concentration of trace elements (Al, Cd, Cr, Cu, Fe, Mn, Pb, and V) in biological material prepared by a wet-ashing procedure. The final wet-ashing procedure, applied in the present work, was as follows: cover 100-150 mg of dry sample with 100 microliters of concentrated sulphuric acid, and heat until fumes of sulphur trioxide appear. Then add dropwise 1.5-2 ml of 50 percent hydrogen peroxide until a clear solution is reached. Cool and dilute to 10 ml with twice-distilled water. Solutions prepared in this way were suitable for all the elements studied. All calibration curves were obtained with 10-microliter amounts of each 'pure' standard solution prepared in 0.18 M sulphuric acid. Subsequently, the effects of the matrix elements, calcium, potassium, sodium, and phosphorus were investigated. The interference of sulphur was taken into consideration by applying a 0.18 M sulphuric acid standard solution. The results showed that there were no interferences for the elements Al, Cd, Cu, Cr, Fe, and Mn; for all these metal ions, the calibration curves found were the same as with 'pure' standard solutions. There are very strong interferences with the absorbance signal in the case of lead. The 'pure' standard solutions of this element gave absorbance signals which were about three times higher than the signals in the case of the IBS matrix. Interferences were less significant in the case of vanadium. The results verified the usefulness and speed of the wet-ashing procedure for destroying biological materials and of the flameless atomic absorption procedure for analyzing particular trace elements in these materials. (Mortland-Battelle)
W74-04868

VOLTAMMETRIC BEHAVIOUR OF COPPER(III) AND ITS ANALYTICAL APPLICATIONS,
Siena Univ. (Italy). Istituto di Chimica Generale.
G. Raspi, P. Zanello, A. Cinquantini, and P. Corti.
Analytica Chimica Acta, Vol 66, No 3, p 435-442, October 1973. 2 fig, 3 tab, 19 ref.

Descriptors: *Copper, *Electrochemistry, *Chemical analysis, Aqueous solutions, Heavy metals, Methodology, Hydrogen ion concentration, Cations, Anions, Pollutant identification.
Identifiers: *Voltammetry, *Metal complexes, *Ligands, Reproducibility, Periodates, Tellurates, Amperometric titration, Ionic interference, Detection limits.

The voltammetric behavior of diperiodatocuprate(III) and ditelluratocuprate(III) complexes was investigated in aqueous solution at a platinum microelectrode for which the diffusion layer was periodically renewed. The voltammetric determination of Cu(II) was also investigated. The copper(II) and copper(III) complexes with periodate or tellurate ligands are electroactive at a smooth platinum electrode, giving an anodic, cathodic or cathanodic wave in the presence of alkaline hydroxide solutions containing copper(II), copper(III), or copper(II)-copper(III) species, respectively. The following analytical applications are proposed: (a) amperometric titration of copper(III) solutions; (b) voltammetric determination of copper. Results of amperometric titrations of copper(III) were similar to those by an established procedure. Voltammetry of copper(II) allows the metal to be determined down to concentrations of 0.00001 M, even in the presence of different ions; the procedure can be applied to such heat-transfer media for nuclear reactors as sodium and potassium metals and their hydroxides. (Holoman-Battelle)
W74-04870

CONFIRMATION OF HEXACHLOROBENZENE BY CHEMICAL REACTION,
Institut National de la Recherche Agronomique, Versailles (France).
B. E. Baker.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 279-284, November 1973. 4 fig, 4 ref.

Descriptors: *Chemical reactions, *Pollutant identification, *Methodology, Organic compounds, Separation techniques, Chlorinated hydrocarbon pesticides, Fungicides.
Identifiers: *Hexachlorobenzene, Chlorinated hydrocarbons, Lindane, Monoethoxypentachlorobenzene.

When hexachlorobenzene (HCB) is treated with sodium ethoxide, monoethoxypentachlorobenzene is formed. This chemical reaction can be used to identify and confirm the presence of HCB. That this same derivative can be used to identify HCB in the presence of isomers of lindane has been confirmed. A hexane solution of 1 microgram each of HCB and lindane was treated with sodium ethoxide and mixed with water. Sufficient HCl was added to give an acid reaction, the mixture extracted with hexane, dried over sodium sulfate, and analyzed by GC. After heating under reflux for 1 hr, product analysis showed the presence of unreacted HCB, MEPCB, and an unidentified peak X. (Holoman-Battelle)
W74-04871

OXYCHLORDANE RESIDUES IN HUMAN ADIPOSE TISSUE,
Environmental Protection Agency, Perrine, Fla. Primate and Pesticides Effects Lab.
F. J. Biros, and H. F. Enos.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 257-260, November 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Pesticide residues, *Gas chromatography, *Mass spectrometry, DDE, DDT, Separation techniques, Monitoring, *Pollutant identification.
Identifiers: *Adipose tissue, *Oxychlordane, Beta-HCH, Biological samples, Heptachlor epoxide, Sample preparation, Thin layer chromatography, Chlordane.

Twenty-seven specimens of adipose tissue collected from post-mortem examinations and therapeutic surgery were analyzed for a series of organochlorine residues by gas and thin-layer chromatography. Results were confirmed using mass and infrared spectral analyses. Two column were employed for gas chromatography: 1.5 percent OV-17/1.95 percent QF-1, RRT subaldrin of oxychlordane, 1.38 at 200 C and 5 percent OV-21 RRT subaldrin of oxychlordane, 1.56 at 180 C. Th tissue was extracted with petroleum ether. Result showed the presence of beta-HCH, oxychlordane p,p'-DDE, o,p'-DDT, p,p'-DDT, and heptachlo epoxide. The occurrence of storage of oxychlor dane residues in general population human adipos tissue may indicate consistent previous exposur to chlordane insecticide and/or oxychlordane fro many possible sources. (Little-Battelle)
W74-04872

REDESCRIPTION OF MAPPATES PLATAXU RANGNEKAR (COPEPODA: CALIGIDAE),
Kerala Univ., Trivandrum (India). Dept. Aquatic Biology and Fisheries.
For primary bibliographic entry see Field 2I.
W74-04877

THE CHARACEAE OF SOUTHEASTER UNITED STATES,
Rhode Island Univ., Kingston. Dept. of Botany.
M. C. Choudhary, and R. D. Wood.
The American Midland Naturalist, Vol 90, No 2, 413-446, October 1973. 1 tab, 93 ref.

Descriptors: *Chara, *Chlorophyta, *Southea U.S., *Speciation, Varieties, *Systematic Aquatic algae, Marine algae.
Identifiers: *Nitella, Chara vulgaris, Cha canescens, Chara globularis, Chara zeylanic Chara braunii, Chara fibrosa, Chara hornemann Nitella flexilis, Nitella acuminata, Nitella clava Nitella cernaua, Nitella capillata, Nitella furca Nitella tenuissima, Nitella gracilis, Nitella hyalin Nitella translucens, Chara globularis var. virga Chara globularis var. leptosperma, Nitella clava var. dilatata, Nitella gracilis var. leptosoma, Nit la gracilis var. asagrayana, Nitella gracilis v capitellata.

A study was made of characeae of the southeastern states based upon preserved and h barium specimens. The findings are compiled i floristic report containing a key to species, no on each species and variety - a brief synonym list of published records, sources of illustratio and exsiccatae and remarks on the taxa. T Characeae of the Southeast comprise two gene Chara and Nitella, and 17 species which repres a large proportion of the three genera and 22 s cies treated for North America. The frequency occurrence of Characeae was 5 percent, far lo than the 19 percent in Fiji and 28 percent in A tralia. A new taxon, N. flexilis var. america from Florida, resembles N. flexilis but has disti mueus. Taxa newly reported for the region are globularis var. virgata, var. leptosperma, clavata var. dilatata, and N. gracilis var. leptoso and var. asagrayana. Particular attention is paid the infraspecific variation of C. zeylanica, an number of varieties and forms previously recor from other areas were found to be represented the Southeast. Mohr's (1884) unusual collecti from Mobile were re-examined, and for the m part the original identifications were confirm (Holoman-Battelle)
W74-04879

TAXONOMY, DISTRIBUTION AND ECOLO OF THE GENUS SESARMA (CRUSTACI DECAPODA, GRAPSIDAE) IN EASTE NORTH AMERICA, WITH SPECI REFERENCE TO FLORIDA,
Smithsonian Tropical Research Inst., Balb Canal Zone.
For primary bibliographic entry see Field 2I.
W74-04880

SCANNING ELECTRON MICROSCOPY BACTERIAL COLONIES,
Agricultural Research Service, Peoria, Northern Regional Research Lab.
E. G. Afrikian, G. St. Julian, and L. A. Bulla, Jr

Applied Microbiology, Vol 26, No 6, p 934-937, December 1973. 3 fig, 14 ref.

Descriptors: *Pollutant identification, *Cytological studies, Methodology, Electron microscopy, Cultures, Bacteria.
Identifiers: *Scanning electron microscopy, *Bacterial colonies, Reproducibility, Sample preparation, Culturing techniques, Bacillus cereus, Bacillus subtilis, Bacillus cereus var. mycoides, Culture media.

A technique is described for observing bacterial colony growth. Bacillus cereus, B. subtilis, and B. cereus var. mycoides were grown on strips of dialysis membrane layered on nutrient agar. Microcolonies of the organisms on strips were fixed in Formalin vapor in situ; the strips then were removed from the agar and secured to scanning microscope specimen stubs without markedly disturbing the cellular arrangement. Scanning electron micrographs clearly depict morphology of individual cells, as well as the spatial orientation of cells within the colony. This technique is reproducible, adaptable, and simple. (Holoman-Battelle)
W74-04885

RECOVERY AND IDENTIFICATION OF ANAEROBES: A SYSTEM SUITABLE FOR THE ROUTINE CLINICAL LABORATORY,
Columbia-Presbyterian Medical Center, New York. Diagnostic Microbiology Service.
P. D. Ellner, P. A. Granato, and C. B. May.
Applied Microbiology, Vol 26, No 6, p 904-913, December 1973. 4 fig, 8 tab, 16 ref.

Descriptors: *Anaerobic bacteria, *Pathogenic bacteria, *Pollutant identification, *Isolation, Methodology, Laboratory tests, Antibiotics(Pesticides).
Identifiers: Culture media, *Culturing techniques, *Recovery, Selective media, Gas liquid chromatography, Gram-negative bacteria, Gram-positive bacteria, Clostridium cadaveris, Clostridium histolyticum, Clostridium lentoputrescens, Clostridium subterminale, Clostridium tetani, Clostridium cochlearium, Body fluids, Blood, Biochemical tests, Bacteroides serpens, Bacteroides spp, Drug resistance, Fusobacterium nucleatum, Fusobacterium spp, Eubacterium spp, Arachnia propionica, Peptococcus magnus.

A system is described in which clinical specimens to be cultured for anaerobes are plated on reducible media and incubated in Gas Pak jars for 24 h. Clinical specimens were carfully selected for culture using this system. Generally those specimens originating from body sites harboring normal commensal flora were not cultured. Several experimental formulations of the prereduced anaerobically sterilized (PRAS) transport media were compared with Amies transport medium without charcoal. Using Clostridium novyi B, no significant advantage was observed with the experimental media over Amies medium. Selective and nonselective formulations of reducible media were used for primary isolation. The isolates were identified according to the Gram stain of the pure chopped meat glucose (CMG) culture in combination with gas-liquid chromatography. Pure, undiluted 24-h CMG culture was used to inoculate anaerobic blood agar (anBAP) for antibiotic susceptibility testing. Antibiotic disks of penicillin, ampicillin, carbenicillin, chloramphenicol, tetracycline, erythromycin and clindamycin were used. The methods have been tested in a high-volume routine microbiology laboratory (more than 700 specimens per day), but are also suitable for smaller laboratories. The system permits improved recovery and identification of the majority of anaerobes within a time period commensurate with clinical practice. Preliminary reports with presumptive identification are often available within 48 h, and the final report with complete identification and antibiogram is usually available within 4 days. (Holoman-Battelle)
W74-04886

METHOD FOR RADIORESPIROMETRIC DETECTION OF BACTERIA IN PURE CULTURE AND IN BLOOD,
Biospherics, Inc., Rockville, Md.
J. R. Schrot, W. C. Hess, and G. V. Levin.
Applied Microbiology, Vol 26, No 6, p 867-873, December 1973. 6 fig, 2 tab, 21 ref.

Descriptors: Methodology, *Bacteria, *Pollutant identification, *Radioactivity techniques, Testing procedures, Laboratory tests, Laboratory equipment, Carbon radioisotopes, Instrumentation, Time, E. coli, *Cultures, Streptococcus, Detergents.
Identifiers: Pure cultures, *Blood, *Radiorespirometry, Trace levels, Carbon dioxide evolution, Culture media, Body fluids, Biological samples, Pseudomonas aeruginosa, Klebsiolla, Staphylococcus aureus, Salmonella paratyphi B, Salmonella typhi, Salmonella dysenterae, Haemophilus aphrophilua,Enterobacter aerogenes, Serratia marcescens, Proteus vulgaris, Cardiobacterium, Rhozyme, Triton X-100.

Methods are described for the detection of low numbers of bacteria by monitoring C-1402 evolved from C-14-labeled substrates. Cell suspensions are filtered with membrane filters, and the filter is then moistened with 0.1 ml of labeled medium in a small, closed apparatus. Evolved C-1402 is collected with Ba(OH)2-moistened filter pads and assayed with conventional radioactivity counting equipment. The kinetics of C-1402 evolution are shown for several species of bacteria. Fewer than 100 colony-forming units of most species tested were detected in 2 h or less. Bacteria were inoculated into blood and the mixture was treated to lyse the blood cells. The suspension was filtered and the filter was placed in a small volume of labeled medium. The evolved C-1402 was trapped and counted. A key development in the methodology was finding that an aqueous solution of Rhozyme and Triton X-100 produced lysis of blood but was not detrimental to bacteria. (Holoman-Battelle)
W74-04887

UREASE ACTIVITY OF ENTEROBACTERIACEAE: WHICH MEDIUM TO CHOOSE,
Ghent Rijksuniversiteit (Belgium). Lab. for Pharmaceutical Microbiology.
A. Vuye, and J. Pijck.
Applied Microbiology, Vol 26, No 6, p 850-854, December 1973. 1 fig, 4 tab, 11 ref.

Descriptors: *Pollutant identification, *Enteric bacteria, Coliforms, Shigella, Salmonella, Aerobic bacteria, Pathogenic bacteria.
Identifiers: *Culture media, *Urease, *Biosynthesis, *Selective media, Biochemical characteristics, Enzyme activity, Solid media, Liquid media, Biological samples, Proteus spp, Yersinia, Escherichia, Edwardsiella, Arizona, Citrobacter, Klebsiella pneumoniae, Klebsiella ozoenae, Klebsiella rhinoscleromatis, Enterobacter cloacae, Enterobacter aerogenes, Enterobacter hafniae, Enterobacter liquefaciens, Pectobacterium, Serratia, Providencia, Elek medium, Christensen urea agar, Fecal coliforms, Stuart media, Proteus mirabilis.

Detection and intensity of urease activity in enterobacteriaceae greatly varies as a function of the media or techniques used, or both. A comparative investigation on several solid and liquid media led to the following conclusions. (1) Detection of Proteus spp. can be adequately performed with the highly selective solid medium described by Cook (1948), as well as with the different liquid media described (Stuart standard and rapid media; Elek medium). (2) Detection of Klebsiella should be based upon urease production on solid media with low buffer capacity (Christensen, 1964). (3) For the identification of Yersinia, either the solid Christensen urea agar or the rapid Elek technique gives optimal results. (Holoman-Battelle)
W74-04888

ESTIMATING THE DENSITY OF INDIVIDUAL BACTERIAL POPULATIONS INTRODUCED INTO NATURAL ECOSYSTEMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
S. K. A. Danso, M. Habte, and M. Alexander.
Canadian Journal of Microbiology, Vol 19, No 11, p 1450-1451, November 1973. 2 fig, 1 ref.

Descriptors: *Bacteria, *Soils, *Cultures, Ecosystems, Growth rates, Inhibitors, Antibiotics(Pesticides), Pollutant identification, Methodology, Cultures, Measurement.
Identifiers: Xanthomonas campestris, Erwinia carotovora, Rhizobium trifolii, Rhizobium meliloti, Mutants, Streptomycin, Neomycin, Polymyxin, Penicillin, Tetracycline, Chloramphenicol, Crystal violet, Congo red, Culture media.

The abundance of individual strains of Xanthomonas, Erwinia, and Rhizobium added to soil was determined by a method that allows for the enumeration of surviving cells on the introduced population in the presence of many other soil microorganisms. The method should be useful for measuring numbers of other bacteria in heterogeneous communities. The method involves using mutants of the species of interest which are resistant to antibacterial agents that prevent the growth of nearly all other populations in the environment. The bacteria used were Xanthomonas campestris, Erwinia carotovora, Rhizobium trifolii, and Rhizobium meliloti. Streptomycin was selected as the chemical of choice since Rhizobium mutants could be obtained easily by growing the cultures in yeast extract - mannitol broth containing about 50 micrograms streptomycin sulfate/ml and transferring the survivors to the same medium containing higher antibiotic concentrations. By these means, isolates resistant to 1000 micrograms streptomycin sulfate/ml were obtained. Spontaneous mutants of X. campestris and E. carotovora were obtained by inoculating large numbers of the cells into trypticase soy broth containing 800 micrograms streptomycin sulfate/ml, incubating the broth until growth was observed, plating the suspension on a solid medium of the same composition. It should not be too difficult to obtain mutants of other species which grow in media containing antibacterial compounds in concentrations sufficiently high to prevent the replication of large percentages of the residents of natural ecosystems. (Mortland-Battelle)
W74-04890

THE EFFECT OF THYROXINE AND TRIIODOTHYRONINE ON BACTERIAL GROWTH,
Bar-Ilan Univ., Ramat Gan (Israel). Dept. of Life Sciences.
N. Garber, and B. Lupowitz-Donenfeld.
Canadian Journal of Microbiology, Vol 19, No 11, p 1401-1405, November 1973. 7 fig, 21 ref.

Descriptors: E. coli, *Growth rates, *Bacteria, Pseudomonas, Salmonella, Streptococcus, Bioindicators, Cultures, Iron, Calcium, Chelation, Turbidity, Inhibitors, Separation techniques, Isolation.
Identifiers: *Thyroxine, *Triiodothyronine, EDTA, Hormones, Bacillus cereus, Bacillus licheniformis, Streptococcus faecalis, Staphylococcus albus, Serratia marcescens, Shigella boydii, Pseudomonas aeruginosa, Salmonella typhi, Aerobacter aerogenes, Potassium iodide, Differential media, Gram-negative bacteria, Gram-positive bacteria, Bacterial physiology.

The effects of L-thyroxine, D-thyroxine, and 3,5,3'-triiodothyronine on the growth of several Gram-positive and Gram-negative bacteria were examined. The first two compounds, at a concentration of 0.000077 M, were found to have a considerable inhibitory effect while 3,5,3'-triiodothyronine had a very weak effect on the growth of the Gram-positive bacteria examined.

The growth of the Gram-negative bacteria was not inhibited under the same conditions. Potassium iodide, at the same concentration, was not inhibitory. Release of free iodine from the thyroxine preparation was also excluded as contributing to the thyroxine effect because it was shown to be less toxic than thyroxine for Bacillus cereus 569 and to exhibit a similar inhibitory effect on Gram-positive and Gram-negative bacteria. The inhibition of Gram-positive bacteria by L-thyroxine was reduced by cations such as Mn(2 plus), Fe(2 plus), and Ca(2 plus). However, the hormones were more potent in their effect compared to EDTA in the same molar concentration and the inhibition exerted by them was not so easily abolished by the divalent cations as it was in the case of EDTA. Although chelation could contribute to the inhibition of the bacteria by the iodinated hormones, it seems that it is not the only factor involved. (Mortland-Battelle)
W74-04891

METHOD FOR ROUTINE CULTURING OF STRICT ANAEROBIC BACTERIA,
Pretoria Univ. (South Africa). Dept. of Microbiology.
L. van Wyk.
Laboratory Practice, Vol 22, No 11, p 681, November 1973. 6 ref.

Descriptors: *Anaerobic bacteria, *Cultures, Incubation.
Identifiers: Agars, Reazurin, Inoculation, Slant cultures, Sample preservation, Culture media, Sample preparation, Culturing techniques.

Routine culturing of marine anaerobes is accomplished by adding 4 ml anaerobic medium to McCartney bottles previously gassed with a CO2, N2, and H2 mixture. The tightly stoppered bottles are sterilized at 121C for 15 minutes and cooled in a slanted position. The bottles are then filled with a sterile semisolid agar containing 0.15 g washed agar, 0.0001 g reazurin, 2.5 ml reducing solution, and 100 ml distilled water. This agar together with rubber-lined metal caps, protects the slant culture from air, and the indicator shows if the medium becomes too oxidized to permit growth of the anaerobes. Inoculation of the slants can be carried out with a platinum loop in a stream of sterile CO2 without air ever coming into direct contact with the grown medium. By this method cultures of anaerobic bacteria from sheep rumen were effortlessly maintained. After initial incubation at 38C for 48 hr, cultures were stored at 4C for 60 d, whereupon transfers were successfully made to fresh anaerobic slants. Slides for gram stains were easily prepared from these slant cultures. Since the preparation of media is time consuming, a large number of McCartney bottles may be simultaneously prepared as described and stored at 4C until required without marked changes in the medium taking place. (Mortland-Battelle)
W74-04894

LIPOPOLYSACCHARIDE FROM A GRAM-NEGATIVE MARINE BACTERIUM,
Providence Coll., R.I. Dept. of Biology.
A. Mongillo, K. Deloge, D. Pereira, and G. P. O'Leary.
Journal of Bacteriology, Vol 117, No 1, p 327-328, January 1974. 1 tab, 18 ref.

Descriptors: *Marine bacteria, *Lipids, Sands, Sea water, Cultures, Nutrients, Sodium chloride, Centrifugation, Chromatography, *Rhode Island.
Identifiers: *Lipopolysaccharides, Lipid A, Pseudomonads, *Narragansett Bay(R.I.), Paper chromatography.

To investigate the occurrence of marine lipopolysaccharides, a number of marine microorganisms were isolated from sand and seawater collected from Narragansett Bay, Rhode Island. Upon initial screening, one organism was chosen for analysis. Cultural and biochemical characteristics indicated that the organism was a nonmotile pseudomonad. The organism was routinely cultivated at room temperature with constant shaking in a medium containing 5.0 g of nutrient broth, 8.0 g of yeast extract, and the complete salts solution per liter of distilled water. The organism was grown for 24 hr, harvested by centrifugation, washed in complete salt solution, and extracted by the phenol-salts method. The material isolated from this marine pseudomonad as lipid A showed many of the characteristics of other lipid A molecules: it contained glucosamine, and phosphate; its solubility in lipid solvents such as chloroform indicated the presence of fatty acids; and the two hexoses present, glucose and galactose, are also commonly found in the polysaccharide portion of the LPS molecule. Absent from the preparation was the heptose monosaccharide. The absence of the core could indicate that this pseudomonad may only produce an incomplete LPS. Another possibility is that the proper concentration of cations were not present during the extraction to hold the core portion intact. The organism does, however, possess a type of lipopolysaccharide molecule. (Mortland-Battelle)
W74-04896

THE ESTIMATION OF RELATIVE POTENCY FROM TWO PARABOLAS IN SYMMETRIC BIOASSAYS,
Edinburgh Univ. (Scotland). Dept. of Statistics.
D. A. Williams.
Biometrics, Vol 29, No 4, p 695-700, December 1973. 2 tab, 3 ref.

Descriptors: *Estimating, *Statistical methods, Equations, *Bioassay, Lethal limit, Mathematical studies.
Identifiers: Symmetric bioassay, *Relative potency, Mean square error, Parabolas.

Three estimators of relative potency from two parabolas in symmetric bioassays, the estimator proposed by Elston (1965), the maximum likelihood (ML) estimator, and the usual estimator assuming linearity, are compared. The results of a simulation study indicate that in well designed assays Elston's estimator performs at least as well as the other two estimators, whether or not the log-dose response regression is linear. (Holoman-Battelle)
W74-04899

AN APPRAISAL OF IDENTIFICATION METHODS FOR PENICILLIUM SPECIES: NOVEL TAXONOMIC CRITERIA BASED ON TEMPERATURE AND WATER RELATIONS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Food Research.
J. I. Pitt.
Mycologia, Vol 65, No 5, p 1135-1157, September/October 1973. 1 fig, 6 tab, 22 ref.

Descriptors: *Cultures, *Speciation, *Fungi, Systematics, Temperature, Pollutant identification, Methodology.
Identifiers: *Culture media, *Water activity, *Penicillium, Eupenicillium, Paecilomyces, Talaromyces.

Examination of media and methods currently used in Penicillium taxonomy led to the conclusion that by using only two media, Czapek yeast autolysate agar and malt extract agar, and by incubating cultures at 25C for 7 days, one could obtain classical taxonomic data with optimal efficiency. The effect of reduced water activity and reduced and elevated temperatures on the growth of Penicillium spp. accepted in the Raper and Thom A Manual of the Penicillia was studied. On a glycerol-nitrate salts agar of 0.93 water activity, and on Czapek yeast autolysate agar at 5C and 37C, extent of growth after 7 days provided taxonomically valuable data; within-species variation was low, while between-species variation was sufficiently marked to assist in determinative classification. Moreover, water relations, as assessed by the above technique, showed a very high correlation with penicillus type in some Sections of the genus. (Little-Battelle)
W74-04902

IMPROVED PH CONTROL OF FUNGAL CULTURE MEDIA,
National Research Council of Canada, Saskatoon, (Saskatchewan). Prairie Regional Lab.
J. J. Child, C. Knapp, and D. E. Eveleigh.
Mycologia, Vol 65, No 5, p 1078-1086, September/October 1973. 1 fig, 4 tab, 14 ref.

Descriptors: *Fungi, *Hydrogen ion concentration, *Growth rates, Phosphates.
Identifiers: *Culture media, Aspergillus midulans, Penicillium patulum, Claviceps, Sporulation, Allomyces arbusculus, Aspergillus fonsecaeus, Chaetomium funicola, Coprinus comatus, Geotrichum candidum, Neurospora crassa, Penicillium chrysogenum, Pythium acanthicum, Rhizopus sexualis, Saccharomyces cerevisiae, Sordaria funicola, Ustilago maydis, Zygorhynchus.

A number of fungi grew well in the presence of relatively high concentrations (40 millimoles) of phosphate and MES (2-(N-morpholino) ethane sulfonic acid) buffers at either pH 5.5 or 7.0. In certain instances better growth and sporulation were observed than that found using more conventional growth media (malt, Czapek-Dox) that lack any marked buffering capacity. EMTA (3,6-endomethylene-1,2,3,6-tetrahydro-cisphthalic acid) could be used as a buffer for fungal culture media with certain species only. As good growth and no major change in chemical composition occurred, these buffers are recommended for use in high concentration to eliminate pH variation in comparative physiological studies. Fungal strains used were: Allomyces arbusculus, Aspergillus fonsecaeus, Chaetomium funicola, Claviceps sp., Coprinus comatus, Geotrichum candidum, Pythium acanthicum, Rhizopus sexualis, Saccharomyces cerevisiae, Sordaria funicola, Ustilago maydis, and Zygorhynchus sp. (Little-Battelle)
W74-04903

COMPOSITION AND WASTE LOAD OF UNIT EFFLUENTS FROM A COMMERCIAL LEAFY GREENS CANNING OPERATION,
Georgia Univ., Experiment. Div. of Food Science.
W. A. Bough.
Journal of Milk and Food Technology, Vol 36, No 11, p 547-553, November 1973. 1 fig, 7 tab, 14 ref.

Descriptors: *Effluents, *Canneries, *Waste identification, Acidity, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, Dissolved solids, Hydrogen ion concentration, Waste disposal, *Pollutant identification.
Identifiers: *Vegetables, Characterization, Settleable solids, Effluent standards.

Analysis of data on composite waste loads from canning of collard, turnip, mustard, spinach, and kale greens revealed no significant differences among the five types of greens. For unit effluents from the dunker washers, reel washers, and blancher, significant differences were found for solids load and total acidity. The most concentrated effluent was from the tumbler fillers. The average composite waste load for all leafy greens was 20.2 plus or minus 5.7 lb/ton COD, 8.5 plus or minus 2.8 lb/ton BOD, 2.8 plus or minus 1.2 lb/ton suspended solids, and 2,666 plus or minus 427 gal/ton waste water. These values are less than one-half of those previously reported for wastes from spinach greens. These results suggest possibly improvement for inplant control of waste from leafy greens, and may also be relevant to the setting of effluent standards for the fruit and vegetable industry. (Mortland-Battelle)
W74-04904

MULTIPURPOSE MEDIUM FOR USE WITH PSEUDOMONAS SPECIES,
Boston City Hospital, Mass. Channing Lab.
S. L. Rosenthal.
Applied Microbiology, Vol 26, No 6, p 1013-1014, December 1973. 1 tab, 3 ref.

Descriptors: *Pseudomonas, *Pollutant identification, *Testing procedures, Denitrification, Hydrolysis, Cultures, Aerobic bacteria, Methodology.
Identifiers: *Culture media, *Biochemical characteristics, Chemical composition, Substrate utilization, Gelatinase, Starch, Acinetobacter, Pseudomonas aeruginosa, Pseudomonas maltophilia, Pseudomonas cepacia, Pseudomonas putida, Pseudomonas pseudoalcaligenes, Pseudomonas alcaligenes, Pseudomonas marginata, Pseudomonas stutzeri, Pseudomonas acidovorans, Pseudomonas diminuta, Pseudomonas fluorescens, Pseudomonas mendocina, Pseudomonas testosteroni.

A medium consisting of the following can be used to detect starch hydrolysis, gelatinase production, and denitrification by pseudomonads: yeast extract (Difco) 5 g; KNO3, 5 g; K2HPO4, 1 g; gelatin, 4 g; soluble starch, 2 g; agar (Difco), 15 g; water, 1,000 ml. Fifty-eight Pseudomonas strains were grown on the medium. The identity of P. aeruginosa was confirmed by the presence of the characteristic odor and pigments and by the possession of acetamide deaminase. The requirement for methionine as a growth factor served as a confirmatory test for P. maltophilia. The remaining species were identified by a battery of 14 single carbon source assimilation tests. All strains grew rapidly and well on the medium. Forty-nine Acinetobacter strains were also tried. All grew well aerobically and had either positive or negative tests for gelatinase. None grew anaerobically. (Holoman-Battelle)
W74-04906

ISOLATION AND CHARACTERIZATION OF A THERMOTOLERANT METHANOL-UTILIZING YEAST,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
D. W. Levine, and C. L. Cooney.
Applied Microbiology, Vol 26, No 6, p 982-990, December 1973. 5 fig, 3 tab, 17 ref.

Descriptors: *Isolation, *Pollutant identification, *Cytological studies, *Biological properties, Yeasts, Soil fungi, Growth rates, Toxicity, Heat resistance, Organic compounds, Soil microorganisms, Temperature, Proteins, Amino acids, Methodology, Chemical analysis.
Identifiers: *Methanol, Characterization, *Hansenula polymorpha, Ascomycetes, Substrate utilization, Growth media, Chemical composition, Continuous cultures, Culture media, Nucleic acids, Rats.

A yeast capable of growth on methanol as its sole carbon-energy source was isolated from soil samples and identified as a strain of Hansenula polymorpha. A continuous enrichment culture at 37C with a simple mineral salts medium was used to select this organism. The isolate, designated DL-1, has a maximal specific growth rate of 0.22 per h, at pH 4.5 to 5.5 and temperatures of 37 to 42C, in simple mineral salts medium with methanol (0.5 percent), biotin, and thiamine. Growth occurred in a chemostat at temperatures up to 50C, with strong growth at 45C. The maximal growth yield of the yeast on methanol was 0.36 g of dry cell weight per g of methanol, and the yield on oxygen was 0.37 g of dry cell weight per g of O2. Protein content of the isolate is 46 percent, and total nucleic acid content varies from 5.0 to 7.0 percent with increasing growth rate from 0.08 to 0.20 per h. The amino acid profile of this yeast protein indicated that it could serve as a good source of food protein. Feeding studies with rats show the yeast to have no toxic effects. (Holoman-Battelle)
W74-04907

IDENTIFICATION OF BACTERIA BY COMPUTER: GENERAL ASPECTS AND PERSPECTIVES,
Central Public Health Lab., London (England). National Collection of Type Cultures.
S. P. Lapage, S. Bascomb, W. R. Willcox, and M. A. Curtis.
Journal of General Microbiology, Vol 77, No 2, p 273-290, August 1973. 1 fig, 7 tab, 26 ref.

Descriptors: *Aerobic bacteria, *Numerical analysis, *Computer programs, *Enteric bacteria, Probability, Statistical methods, Laboratory tests, E. coli, Pathogenic bacteria, Coliforms, Shigella, Pseudomonas, Pollutant identification.
Identifiers: Salmonella typhi, Moraxella, Citrobacter, Chromobacterium violaceum, Pasteurella, Gram-negative bacteria.

A probability method for identification of bacteria is discussed. Gram-negative, rod-shaped bacteria were chosen as a model and a table (matrix) was constructed which contained the estimated probabilities of a positive result in each test for each taxon. The results of tests on an unknown strain were compared with the stored probabilities and the likelihood that the strain belonged to each of the matrix taxa was calculated in turn by multiplication of the relevant probabilities. These likelihoods were normalized and the value for each taxon referred to as the identification score for that taxon. This procedure was applied to reference strains and to freshly isolated strains (field strains) from various medical diagnostic bacteriological laboratories. The resulting data were used to improve the matrix, investigate the number of tests needed for identification, estimate test differences between laboratories and for test selection strategies. The matrix was stored in a computer in which all calculations were carried out. Identification rates for fermentative bacteria of 90.8 percent for reference strains and 89.4 percent for field strains were obtained, and for non-fermentative bacteria of 82.1 percent and 70.8 percent respectively. The field strains were received because they were difficult to identify in the medical diagnostic laboratory; higher rates of identification might be expected for typical strains. (See also W74-04910) (Mortland-Battelle)
W74-04909

IDENTIFICATION OF BACTERIA BY COMPUTER: IDENTIFICATION OF REFERENCE STRAINS,
Central Public Health Lab., London (England). National Collection of Type Cultures.
S. Bascomb, S. P. Lapage, M. A. Curtis, and W. R. Willcox.
Journal of General Microbiology, Vol 77, No 2, p 291-315, August 1973. 5 tab, 178 ref.

Descriptors: *Pollutant identification, *Numerical analysis, *Computer programs, *Enteric bacteria, E. coli, Salmonella, Shigella, Analytical techniques, Laboratory tests, Aerobic bacteria, Pathogenic bacteria, Proteins.
Identifiers: Klebsiella, Gram-negative bacteria.

The results of the identification of 1079 reference strains of Gram-negative, aerobic, rod-shaped bacteria by the probabilistic method in a computer are given. Comparison of identification by conventional methods and by computer showed that 90.8 percent of fermentative and 82.1 percent of non-fermentative strains could be identified on the best available probability matrix. Many of these strains were typical and had caused difficulty in identification in the medical diagnostic laboratory. The implications of various factors in successful computer identification are discussed and the results are given for each taxon by genus and species. (See also W74-04909) (Mortland-Battelle)
W74-04910

REPORT ON THE COMPOSITION OF OIL FROM THE REGION OF NEW HYDROCARBON UPWELLING IN THE SANTA BARBARA CHANNEL,
California Univ., Santa Barbara. Marine Science Inst.
P. G. Mikolaj.
Available from NTIS, Springfield, Va. 22151 Com73-11613; Price $2.75 printed copy; $1.45 microfiche. Report, August 1973. 9 p, 8 fig, 2 tab, 9 ref.

Descriptors: *Oil spills, *California, *Gas chromatography, *Trace elements, Provenance, *Pollutant identification, Chemical analysis, Oil fields.
Identifiers: *Santa Barbara Channel(Calif).

Oil from the area of new hydrocarbon upwelling in the Santa Barbara Channel was analyzed by gas chromatography and characterized by trace elements. The chemical composition of oil from the new area of hydrocarbon upwelling is significantly different from oil originating at the nearshore natural seeps in the vicinity of Coal Oil Point. Compared to oil from the Coal Oil Point region, the new seep oil contains approximately one-half the concentration of nickel and vanadium. Oil from Coal Oil Point is highly naphthenic, while oil from the new seep contains significant amounts of normal paraffins out to carbon number 30 and beyond. Oil from the new seepage area is generally similar to oils produced from the Sisquoc and Monterey formations of the Santa Barbara Channel. The site of the new hydrocarbon upwelling is located in the middle of an area where, during the period 1946 to 1947, previous oil and gas seeps of natural origin were reported. (Knapp-USGS)
W74-04919

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 7C.
W74-04924

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
P. E. Davis.
Available from the National Technical Information Service as PB-228 872, $6.00 in paper copy, $1.45 in microfiche. Research Report No. 36, 1973. 51 p, 7 fig, 4 tab, 5 ref, append. OWRR A-022-TENN(1).

Descriptors: *Water quality, *Monitoring, *Tennessee, *Reservoirs, *Forecasting, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Conductivity, Hydrologic data, Streamflow.
Identifiers: *Fort Loudoun Reservoir(Tenn).

An investigation was made of the reliability of continuous water quality monitoring on Fort Loudoun Reservoir. Two continuous monitoring systems were used, and the parameters of temperature, dissolved oxygen, pH, and conductivity were considered. Manual cross sectioning was used to determine the various values in the stream. At both stations, the data taken from the monitor was found to provide an accurate prediction of the conditions of the stream. A comparison of samples taken at the pumps and at the monitors showed that no appreciable change in any of the parameters was induced by the intake systems.
W74-04982

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5B.
W74-05022

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
For primary bibliographic entry see Field 7B.
W74-05026

A BIOASSAY COMPROMISE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W74-05045

BIOMASS MONITORING OF ALGAL CULTURES BY FLUORIMETRIC MEASUREMENT OF THEIR CHLOROPHYLL CONTENT,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 5C.
W74-05055

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05078

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 4B.
W74-05080

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT, (HEALTH AND SAFETY LABORATORY, AEC, NEW YORK),
Health and Safety Lab. (AEC), New York.
E. P. Hardy, Jr.
Available from NTIS, Springfield, Va., as Rept. HASL-276. $7.60 per copy, $1.45 microfiche. Report HASL-276, Oct. 1973. 176 p, 8 fig, 38 tab, 90 ref, 5 append.

Descriptors: *Radioactivity, *Fallout, *Monitoring, Measurement, *Strontium, Radioisotopes, Sampling, Milk, Water, Food chains, Public health, Forests, Forest soils, Vegetation, Ranges, Diets, Toxicity, Data collections.
Identifiers: *Iridium, *Plutonium, New York City, San Francisco.

Current data are presented from the HASL Fallout Program; The National Center for Atmospheric Research in Boulder, Colorado; The National Radiation Laboratory in New Zealand; and the EURATOM Joint Nuclear Research Centre at Ispra, Italy. Interpretive reports and notes are included on the global deposition of Sr-90 through 1972, sulfate concentrations in the lower stratosphere, global fallout in a forest compared with an open field, and detection of Ir-192 from recent nuclear tests in the southern hemisphere. Extensive tabulations of radionuclide levels in fallout, surface air, stratospheric air, milk, diet, and tap water are included. A bibliography of recent publications related to radionuclide studies is also presented. (See also W74-05175) (Houser-ORNL)
W74-05174

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT - JUNE 1, 1973, THROUGH SEPTEMBER 1, 1973, APPENDIX,
Health and Safety Lab. (AEC), New York.
E. P. Hardy, Jr.
Available from NTIS, Springfield, Va., as Rept. No. HASL-276, Append. $10.60 per copy, $1.45 microfiche. Report No. HASL-276-Appendix, Oct. 1, 1973. 459 p, 5 append.

Descriptors: *Radioactivity, *Fallout, *Monitoring, Measurement, *Strontium, Radioisotopes, Sampling, Milk, Water, Food chains, Public health, Forests, Soils, Ranges, Diets, Toxicity, Data collections, Data processing, Data storage and retrieval, Data transmissions.
Identifiers: *Iridium, *Plutonium.

There are 35 monthly monitoring sites in the United States and 90 in other countries. A map showing the sites is presented. To facilitate the accurate storage, retrieval and handling of the data generated from the monthly fallout collection network, all data have been transcribed to punched cards. To accomplish this transcription several rigid criteria were applied to the data. One condition was that only monthly data were punched onto the cards. The data printed out from the punched cards are presented in tables. Data are given on the following: (A) Sr-90 and Sr-89 in Monthly Deposition at World Land Sites; (B) Radionuclides and Lead in Surface Air; (C) Radiostrontium in Milk and Tap Water; (D) Table of Conversion Factors; (E) Table of Radionuclides. (See also W74-05174) (Houser-ORNL)
W74-05175

LOW-LEVEL RADIOACTIVITY MEASUREMENTS,
National Bureau of Standards, Washington, D.C.
J. M. R. Hutchinson, W. B. Mann, and R. W. Perkins.
Nuclear Instruments and Methods, Vol. 112, p 305-318, 1973. 16 fig, 7 tab, 20 ref.

Descriptors: *Radioactivity, *Measurements, *Assay, *Water pollution, *Measuring instruments, Equipment, Research and development, Monitoring, Radioactive waste, Biological control, Ion transport, Nuclear explosions, Nuclear powerplants, Effluents, Radioisotopes, Public health, Meteorology.

Low-level radioactivity measurements are reviewed. Alpha- and beta-particle, and Gamma-ray low-level-radioactivity counting is discussed, and various detector systems are compared for detection sensitivity. Low-level measurements on bovine liver standard reference material, and radioactive contamination in industrial samples of aluminum, copper, and steel are reviewed. The results of low-level radioactivity intercomparisons are discussed. Intercomparison studies are made from separate sea-water samples and spiked samples from Lake Michigan. (Houser-ORNL)
W74-05178

RADIONUCLIDE BIOMAGNIFICATION IN COASTAL-PLAIN DEER,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W74-05189

A PROPOSED MECHANISM FOR THE RECYCLING OF RADIOCESIUM IN FLORIDA SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
J. F. Gamble.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 133-139, (1971) 1 fig, 3 tab, 26 ref.

Descriptors: *Cesium, *Recycling, Ecology, *Radioecology, Absorption, Milk, Fallout, *Ecosystems, *Florida, Cycles, Cycling nutrients, Food chains, Soils, Fertility, Nutrients, Forests, Radioactive tracers, Tracking techniques, *Path of pollutants.

Cesium-137 levels in Florida milk samples are five to six times higher than the United States average. There is no evidence to suggest that Florida has received unusually high amounts of fallout. The elevated levels are attributed to ecological concentration factors. Preliminary data of ecosystem compartments, part of a larger, detailed program, indicate that the mechanism responsible for the high, continued Cs-137 activity in the Florida biosphere is a combination of cycling within the plant vascular system and a mycorrhizal-plant root association that transfers nutrients directly from litter to the plant. The efficiency of the recycling is enhanced by the low natural fertility of the soils. The nature of the recycling is such that losses of cesium occur primarily in the fruit. In certain grazing situations, higher levels in beef and milk can be explained by the ingestion of palmetto fronds, palmetto berries, and acorns. A Cs-134 tracer study is described, and data are presented for Cs-137 levels found in selected soil and plant compartments from a sand pine-scrub oak community (Pinus clausa-Quercus chapmanii, Q. geminata, Q. myrtiflora) and from a mixed hardwood stand in north central Florida. (See also W74-05181) (Houser-ORNL)
W74-05192

CYCLING OF STABLE CESIUM IN A DESERT ECOYSTEM,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5B.
W74-05195

FLUORIMETRIC METHOD FOR THE DETERMINATION OF URANIUM IN NATURAL WATERS,
Geological Survey of Sweden, Stockholm.
A. Danielsson, B. Ronnholm, L.-E. Kjellstrom, and F. Ingman.
Talanta. Vol 20, No 2, p 185-192, 1973. Illus.
Identifiers: *Fluorometric methods, Natural waters, *Uranium, *Ion exchange, *Pollutant identification, Organic matter.

A method is described for the fluorimetric determination of U in natural waters. The limit is 0.3 ppm. Ion-exchange is used to preconcentrate the U by a factor of 22 and separate it from quenching ions in the sample. The fluorescence is measured in a medium that is 1.35 M in both sulfuric and phosphoric acids. The uranyl ions are excited by radiation of wavelength 280 nm and bandwidth 40 nm. The emitted signal is scanned from 470-510 nm. After spiking of the sample solution with a small volume of standard U solution, the fluorescence signal is scanned again and the U content of the sample calculated from the 2 readings. The coefficient of variation is 8.5% for determinations of U in a synthetic water sample having a U content of 1.9 ppm. Destruction of organic matter in the eluates gives 0.1 ppm detection limit.--Copyright 1973, Biological Abstracts, Inc.
W74-05240

NEW ULTRAVIOLET RATIO SPECTROPHOTOMETRIC SYSTEM FOR THE DETERMINATION OF TRACE AMOUNTS OF PHENOLIC COMPOUNDS,
Villanova Univ., Pa. Dept. of Chemistry.
J. E. Fountaine, P. B. Joshipura, P. N. Keliher, and J. D. Johnson.
Analytical Chemistry, Vol 46, No 1, p 62-66, Jan 1974. 3 tab, 5 fig, 23 ref.

Descriptors: *Analytical techniques, *Water analysis, *Phenols, *Pollutant identification,

pectrophotometry, Ultraviolet radiation, Alinity, Colorimetry, Color reactions.
ntifiers: Bathochromic shift, ASTM standards, inoantipyrine, Cresols, Thymol, Resorcinol, rosine, Microanalysis, Trace analysis.

newly developed instrument is described which s two conventional sealed hollow cathode ps to monitor the UV bathochromic shift that urs when phenolic compounds are alkalized. is UV ratio spectrophotometer has been used to ermine ppb amounts of phenol, o- and psols, resorcinol, thymol, p-methoxyphenol, osine, and similar phenolic derivatives. The UV o method generally gives results that are higher n those obtained in colorimetry with 4inoantipyrine (ASTM Standard Method D-3-70), because para-blocked phenols do not ct with 4-aminoantipyrine. Among other adtages of the new method is the relatively small nple size required, viz., 50 ml, compared to the ml demanded by the ASTM procedure. own-IPC)
4-05244

B RESIDUES IN PLANKTON FROM THE LF OF ST. LAWRENCE,
dford Inst., Dartmouth (Nova Scotia). Marine ology Lab.
M. Ware, and R. F. Addison.
ture, Vol 246, No 5434, p 519-521, Dec. 21/28, 3. 1 fig, 1 tab, 12 ref.

scriptors: *Plankton, *Polychlorinated biphen-, *Pollutant identification, *Particle size, Air lution, Sea water, Water pollution, Sampling, uatic microorganisms, Diatoms, *Canada, Attic Ocean.
ntifiers: Prince Edward Island, Nova Scotia, ulf of St. Lawrence.

ncentrations of polychlorinated biphenyls CB) found in nine standard-net samples of nkta, collected at 10-day intervals from June to g. 1972 about 16 km offshore from the northern ast of Prince Edward Island, were found to be ersely related to particle size. This trend perted despite a 34-fold difference in residue levels tween composite samples, indicating that coninant acquisition is directly proportional to rticle surface area. However, spatial and temral variations in contaminant supply tend to er the PCB concentratiion vs. particle size relanship. Evidence indicated that PCB are transrted from the atmosphere to the sea surface and nce to a plankton. (Brown-IPC)
4-05256

W MEASURING METHODS FOR EVALUATG WASTE WATER QUALITY (NEUERE ESSVERFAHREN ZUR BEURTEILUNG DER WASSERQUALITAET),
rzberger Papierfabrik Ludwig Osthushenrich G., Herzberg am Harz (West Germany).
Petermann.
s Papier, Vol 26, No 10A, p 628-631, 635-637, t. 1972. 2 fig, 26 ref. English summary.

scriptors: *Water quality control, Water analy-, Analytical techniques, Waste ter(Pollution), *Pollutant identification, xygen demand, *Suspended solids, *Color, ily water, Oil pollution, *Pulp wastes, Oil spills, tomation, Pesticides, Chemical oxygen dend, Biochemical oxygen demand, Colorimetry, nitoring, Effluents, Pulp and paper industry.
ntifiers: Biocides, Permanganate number test.

thods in use by the pulp and paper industry to aluate the quality (or polluting effect) of effluent ters are critically assessed, and the need for adional methods is pointed out. Oxygen demand is ng evaluated by 5-day BOD, COD, and permanate number. In addition, most mill effluents are ing tested for settleable solids, undissolved spended) solids, color, and oil content. The possibilities of automating various test methods are discussed. Disturbances in the 5-day BOD determination caused by the presence of biocides are pointed out. (Wise-IPC)
W74-05259

'BAROVIBRA' BOD MEASURING APPARATUS (BAROVIBRA-BSB-MESSGERAET),
K. Muehleisen.
Der Papiermacher, Vol 22, No 1, p 10-11, Jan. 20, 1973. 4 fig.

Descriptors: *Biochemical oxygen demand, Equipment, *Monitoring, *Industrial wastes, *Instrumentation, Measurement, Waste water(Pollution), *Pollutant identification.
Identifiers: Barovibra BOD monitor.

A highly automated electric instrument for measuring the BOD of effluent samples is described. The apparatus is especially suited for monitoring of industrial waste waters. It is easy to operate and gives reasonably accurate results in a short time. Typical data obtained are given and compared with those derived by other methods. (Speckhard-IPC)
W74-05265

ISOLATION AND CHEMICAL IDENTIFICATION OF TOXIC COMPONENTS OF KRAFT MILL WASTES,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
I. H. Rogers.
Pulp and Paper Magazine of Canada, Vol 74, No 9, p 111-116 (Technical Paper T303), Sept. 1973. 4 fig, 5 tab, 18 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, *Pollutant identification, *Toxicity, *Bioassay, Fish, Analytical methods, *Ion exchange, Resins, Cations, Heavy metals, Iron, Copper, Zinc, Chromium, Chlorine, Salmon, *Sockeye salmon, Effluents, Industrial wastes, Water pollution sources, Pulp and paper industry.
Identifiers: Veratrole, Kraft mills, Chlorine compounds, Dehydroabietic acid, Fatty acids, Carboxylic acids, Resin acids.

Toxic organic compounds were isolated from effluents of a bleached kraft mill by a new method, using Amberlite XAD-2 and DEAE-SEPHADEX A-25 ion-exchange resin columns from which organic solutes could be recovered without chemical changes. Bioassays on isolates of different history showed that the mortality of fish (sockeye salmon) was related to the resin acid content of effluents. Resin acids were toxic to young salmon at 2 ppm concentrations in static assays. Dehydroabietic acid was used as a standard reference compound, because of its superior chemical stability. Neutral fractions were nontoxic. Separation of a toxic fraction into its fatty acid and resin acid components indicated that both were toxic. The only chlorinated compound detected was trichloroveratrole (in minor yield). Heavy metals, such as Fe, Cu, Zn, and Cr, made negligible contributions to effluent toxicity. (Brown-IPC)
W74-05270

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS -- DEVELOPMENT OF NUCLEAR TECHNIQUES,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
J. C. Sheppard, G. S. Clifton, and G. A. Grant.
Available from the National Technical Information Service as RLO-2221-T3-3, $4.00 in paper copy, $1.45 in microfiche. Research Report No 73/18/6. February 1, 1973. 33 p, 1 tab, 15 fig, 4 ref. RP 1111, AEC contract AT(45-1)-2221 Task 3.

Descriptors: *Pulp and paper industry, *Radioactivity techniques, *Monitoring, *Additives, Chemicals, Analytical techniques, Pollution abatement, *Water pollution sources, *Neutron activation analysis, Radioisotopes, Tracers, Pigments, Beryllium, Zinc radioisotopes, Titanium, Waterproofing, Polymers, Carbon radioisotopes, Microscopy, Tagging, Trace elements.
Identifiers: Coulomb scattering, Rutherford scattering, Americium, Californium, Zinc oxide, Titanium dioxide, Aquapel, Kymene, Alkyl letene dimers, Sizing agents, Wet strength agents, Waterproofing agents, Microtome sectioning, Pulp mills, Paper mills, Papermaking.

The technique of tagging paper additives with metal ions and complexes was found to have serious limitations. Some additives, such as Kymene (a polyamide-epichlorohydrin wet-strength resin) and Aquapel (an alkyl ketene dimer derived from long-chain fatty acids, used as waterproofing and sizing agent), are sufficiently important to papermaking and pollution control to warrant studying their behavior by tagging with carbon-14. Microtome sectioning plus neutron activation was shown to be a powerful tool in determinations of additive distributions in papers. Another technique of potential utility involves Rutherford or coulomb scattering of charged particles from the paper surface. Neutron activation was used to determine the fate of titanium dioxide and zinc oxide fillers or pigments under actual industrial conditions in a paper mill. This method, too, has considerable utility for observing the path of trace metals in paper mill environments. Such studies will help pulp mills in minimizing the loss of costly chemicals and, simultaneously, the discharge of harmful pollutants. A 30-curie neutron source of americium-241 plus beryllium was shown to have limited use in paper mill experiments. However, a higher-flux source of californium-252 may have potential process-control applications, such as the in-line monitoring of clay and titanium dioxide concentrations. (Brown-IPC)
W74-05287

SPECTROPHOTOMETRIC DETERMINATION OF LOW LEVELS OF MONO-, DI-, AND TRIETHYLENE GLYCOLS IN SURFACE WATERS,
Laboratory of the Government Chemist, London (England). Dept. of Trade and Industry.
W. H. Evans, and A. Dennis.
The Analyst (Journal of the Society for Analytical Chemistry), Vol 98, No 1172, p 782-791, Nov 1973. 6 tab, 23 ref.

Descriptors: *Water analysis, *Pollutant identification, *Alcohols, *Carbohydrates, *Organic compounds, Analytical techniques, Oxidation, Spectroscopy, *Spectrophotometry, Color, Colorimetry.
Identifiers: Glycols, Aldehydes, Ethylene glycol.

The method described involves oxidation of glycols to aldehydes with acidified potassium permanganate solution, followed by reaction with 3-methylbenzothiazol-2-one hydrazone to produce green cationic chromogens which are then measured spectrophotometrically at 630 nm. Omitting the oxidation step gives blank samples to compensate for natural interferences. With glycol recoveries of 1-5 mg/liter at precisions of plus or minus 7% from several water samples, the method was sensitive to 0.5 mg glycol/liter. A more sensitive variation of the method for monoethylene glycol alone is also described. (Brown-IPC)
W74-05290

THE QUANTITATIVE DETERMINATION OF CHROMIUM IN URINE BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY,
Erlangen-Nuremberg Univ. (West Germany).
K. H. Schaller, H.-G. Essing, H. Valentine, and G. Schacke.
Atomic Absorption Newsletter, Vol 12, No 6, p 147-150, November-December 1973. 3 fig, 2 tab, 18 ref.

Descriptors: *Chemical analysis, *Urine, *Chromium, Methodology, Heavy metals, Pollutant identification, Reliability, Trace elements, *Spectrophotometry.
Identifiers: *Body fluids, Flameless atomic absorption spectrophotometry, Biological samples, Chemical recovery, Precision, Detection limits, Absorbance.

Flameless atomic absorption spectrophotometry is considered to be the most suitable method for the determination of chromium in body fluids. This method has been applied to the direct determination of the chromium content of urine. Fifty microliters of a 24-hr urine sample are injected into an electrically heated graphite tube and the determination made at 358 nm. No prior sample preparation is required. To check the accuracy of the method, 5 micrograms/l Cr was added to urine samples not previously exposed to chromium. The median recovery was 93 percent. To determine precision in a series, one urine sample was analyzed twenty times. With a median chromium concentration of 6.02 micrograms/l and a standard deviation of 0.9 microgram/l, the coefficient of variation was equal to 15 percent. The precision from day-to-day, over the course of one week, expressed as the coefficient of variation was 17 percent at the 6-microgram/l level. The detection limit (equivalent to 1 percent absorption) was 0.2 microgram/l chromium in urine using a sample quantity of 50 microliters, equivalent to 10 pg of chromium absolute. (Holoman-Battelle)
W74-05291

A REVIEW OF WATER ANALYSIS BY ATOMIC ABSORPTION,
Perkin-Elmer Corp., Norwalk, Conn.
R. D. Ediger.
Atomic Absorption Newsletter, Vol 12, No 6, p 151-157, November-December 1973. 88 ref.

Descriptors: *Water analysis, Methodology, *Heavy metals, *Alkaline earth metals, *Alkali metals, *Reviews, Pollutant identification, *Chemical analysis, Filtration, Water sampling, Trace elements, Aluminum, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Surface waters, Sodium, Zinc, *Spectrophotometry.
Identifiers: Atomic absorption, Spectrophotometry, Natural waters, Sample preparation, Sample preservation, Sample storage, Preconcentration, Direct flame atomization, Graphite furnace, Delves cup method, Gaseous hydrides, Arsenic, Selenium, Thallium, Tin, Vanadium, Silver, Detection limits.

A review is presented of the analysis of water samples by atomic absorption. A brief summary of preservation and storage methods is presented, along with information on some of the more useful concentration methods and specialized atomization techniques. Each element of major interest in water quality analysis is considered separately and typical analytical procedures are discussed. (Holoman-Battelle)
W74-05292

A TECHNIQUE FOR EXTRACTION AND STORAGE OF WATER SAMPLES FOR MN, CD, AND PB DETERMINATION BY ATOMIC ABSORPTION SPECTROSCOPY,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
R. D. Olsen, and M. R. Sommerfeld.
Atomic Abosorption Newsletter, Vol 12, No 6, p 165-166, November/December 1973. 1 tab, 7 ref.

Descriptors: *Solvent extractions, *Manganese, *Cadmium, *Lead, Methodology, Chemical analysis, Water analysis, Trace elements, Stability, Heavy metals, Separation techniques, Cobalt, Chromium, Copper, Iron, Nickel, Zinc, *Spectrophotometry.
Identifiers: *Metal chelates, Atomic absorption spectrophotometry, Sample storage, Methyl isobutyl ketone.

A method has been developed for stabilizing metal chelates thus allowing extracted metals to be stored for at least 2 weeks at room temperature in an acetone-HCl solution. The stability is attained when the metal chelates are transferred from methyl isobutyl ketone to the acetone-HCl solution. Other limited tests indicate that Co, Cr, Cu, Fe, Ni, and Zn may also be coextracted and stored in acetone-HCl with similar stability. Some signal enhancement associated with MIBK solutions is also retained with the acetone-HCl solution. This technique should permit greater time flexibility in atomic absorption analysis involving multi-element organic extractions of large numbers of water samples. (Holoman-Battelle)
W74-05293

PYROGRAPHIC ANALYSIS OF WASTE WATERS,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
I, Lysyj.
Environmental Science and Technology, Vol 8, No 1, p 31-34, January 1974. 3 fig, 2 tab, 2 ref.

Descriptors: *Water analysis, *Monitoring, Waste water(Pollution), Mathematical studies, Gas chromatography, Organic matter, Statistical methods, Computer programs, Industrial wastes, Water quality, Water pollution, Degradation(Decomposition), Textiles, Pulp wastes, Poultry, Streams, Waste identification, Water pollution sources.
Identifiers: *Pyrographic analysis, Pattern recognition, Thermal decomposition, Pyrolysis, Characterization.

Based on the theory of multicomponent pattern recognition and differentiation, a new analytical approach represents a fundamental departure from the traditional working concept of analytical chemistry. Multicomponent pattern recognition permits definition of a complex chemical composition as a separate entity, and provides means for studying its interactions with other compositions found in environmental matrices. In the pyrographic method, organic matter is subjected to elevated temperatures in the absence of oxygen, leading to thermal decomposition of organic molecules into several preferential fragments. The nature and quantity of such fragments reflect the elemental and structural character of the parent material. Through identification of the pyrolytically produced derivative composition by means of gas chromatography, the nature of the parent material can be defined. By comparing pyrograms of unknown matter with that of known materials, the qualitative nature of the substance in question could be determined. Analysis of water samples is performed automatically. No sample preparation, such as extraction or separation, is required. Interpretation of data is aided by two computer programs. The technique has been studied and evaluated in waste source identification and differentiation, industrial effluent analysis, control of waste treatment process, characterization of organic content of natural waters, and process control in beer brewing and other fields. Its use for stream monitoring, industrial effluent analysis, and waste treatment control are discussed. (Mortland-Battelle)
W74-05294

ATRAZINE, PROPACHLOR, AND DIAZINON RESIDUES ON SMALL AGRICULTURAL WATERSHEDS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-05295

PHOSPHATES IN SEDIMENTS OF PAMLICO ESTUARY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. B. Upchurch, J. K. Edzwald, and C. R. O'Melia
Environmental Science and Technology, Vol 8 No 1, p 56-58, January 1974. 6 fig, 14 ref.

Descriptors: *Phosphates, *Bottom sediments, *Phosphorus, Freshwater, *Estuarine environment, Mixing, Saline water-freshwater interface, Methodology, Inflow, Estuaries, Chemical analysis, Bottom sampling, Aquatic environment, Suspended solids, *North Carolina, Suspension, Sediment transport.
Identifiers: *Pamlico Estuary(N.C.), Pamlico River, Sample preparation.

Of concern is the amount of available phosphorus present in the bottom sediments of North Carolina's Pamlico Estuary along the length of the estuary from a freshwater to an estuarine environment. Bottom sediments were collected at 23 sites from the middle of the Pamlico River with an Ekman dredge. The sediments were frozen, thawed, mixed, dried in an oven at 110 C for 24 h and ground. A modified HCl-H2SO4 extraction procedure was used to extract the available phosphorus from the sediments. After extraction the phosphorus was measured using the vanadomolybdophosphoric acid colorimetric method. The amount of 'available' phosphorus extracted from sediment samples along the 35-mile length of the Pamlico Estuary, was observed to decrease from 1.6 mg P/g sediment in freshwater to 0.3 mg P/g sediment in water with a salinity of 18 ppt. A high correlation (r equals 0.99) between available phosphorus and oxalate-extractable iron was found in the upper reach of the estuary (salinity less than 1 ppt). In the lower part of the estuary the Fe-P correlation decreased (r equals 0.86). The decrease in the available P and in the Fe-P correlation along the length of the estuary is consistent with the suggestion that P is held on suspended sediments by some type of Fe-inorganic P complex of limited stability. Suspended materials entering the estuary in the freshwater inflow could lose phosphorus to solution as they are transported through waters of increasing salinity to the mouth of the estuary. (Holoman-Battelle)
W74-05296

MINICOMPUTERS' ROLE IN MONITORING,
Digital Equipment Corp., Maynard, Mass.
R. J. Epler.
Environmental Science and Technology, Vol No 1, p 28-30, January 1974. 1 fig, 1 tab.

Descriptors: *Digital computers, *Data processing, *Monitoring, *Water pollution, *Water quality, Pollutant identification, Automation, X-ray fluorescence, Nuclear magnetic resonance, Instrumentation, Thermal pollution, Radioactive wastes, Magnetic resonance, Water temperature, Hydrogen ion concentration, Electrical conductance, Dissolved oxygen, Oxidation reduction potential, Gas chromatography, Spectrophotometry, Data collections.
Identifiers: Minicomputers, Analog to digital converters, Microwave spectroscopy.

Many analytical techniques suitable for use in pollutant monitoring lend themselves to use with computers: X-ray fluorescence, microwave spectroscopy, and nuclear magnetic resonance (nmr). Other instrumentation, too, can be used effectively in conjunction with computers. Much of the instrumentation used to monitor pollution can be tied to a computer through appropriate interfacing. Suppose a system is needed to monitor the following parameters in surface water, temperature, pH, electrical conductivity, dissolved oxygen, oxidation-reduction potential, and chloride content. To analyze these parameters in detail, and particularly to interrelate them, would be a difficult task liable to human error. A computer system could be developed that would perform all of these ope

ns easily, and at the same time, present a total cture. The minicomputer is a key to such a stem because it is small, inexpensive, and erant of a wide variety of environmental condi- ns. As an example, the PDP-8/F minicomputer used as the central element of the system. Each trument used in the system, such as a pH meter a conductivity meter, produces an electrical nal that is proportional to the parameter being easured. For the computer to use these signals, o things are necessary: First, the hardware must nvert the signals into a form that the computer n use, and second, correct programming must be ed. To convert alalog signals into digital form, a nverter (ADC) is used, aided by instrumenta- n-grade analog amplifiers, if necessary. Such a stem in a laboratory lends itself to other types of trumentation, such as gas chromatography, ectrophotmetry, and infrared and ultraviolet ectrometry. (Mortland-Battelle)
74-05297

IE ULTRASTRUCTURE OF AN AL- PARASITIC RED ALGA CHOREOCOLAX LYSIPHONIAE,
lorado State Univ., Fort Collins. Dept. of tany and Plant Pathology.
r primary bibliographic entry see Field 5C.
74-05299

LYCHLORINATED BIPHENYLS IN THE ASTAR ACANTHASTER PLANCI,
alla Walla Coll., College Place, Wash. Dept. of ology.
R. McCloskey, and K. H. Deubert.
lletin of Environmental Contamination and xicology, Vol 10, No 5, p 261-264, November 73. 2 fig, 4 ref.

scriptors: *Polychlorinated biphenyls, esticide residues, *Gas chromatography, paration techniques.
ntifiers: *Starfish, Cleanup, Tissue, Echin- erms, Gas liquid chromatography, Thin layer romatography, Electron capture gas chromatog- hy, Nitration, Biological samples.

ocedures for separating PCB in small amounts gonad tissue specimens from the starfish anthaster planci are described. Cleanup was ne using disposable Pasteur pipettes. The lumns were filled with Florisil activated for 24 urs at 130 C. Columns were packed in petroleum er (30-60 C) and washed with 20 ml of petrole- ether prior to use. Extracts equivalent to one to o grams of fixed tissue were used for cleanup d PCBs were eluted with a volume (5-7 ml) of troleum ether (30-60 C) that eluted 1 microgram Aroclor 1254 to approximately 96 percent. A vent blank was run with each extraction. Elu- s were concentrated to 0.5 ml, and 1- to 5- croliter aliquots were analyzed by GLC-EC. C analysis was also carried out. Nitration of aned-up residues did not change the basic peak ttern, except to add new peaks. All tissue ex- cts produced peaks with the following retention es relative to p,p'-DDE: 0.45, 0.79, 1.0, 1.09, 5, 1.70, 2.14, 2.61, and 3.19. These peaks were o obtained with Aroclor 1254, and they did not appear after nitration. TLC analysis of the ex- cts produced spots with R sub f values 0.72, 0, and 0.92, whereas Aroclor 1254 produced o overlapping spots. Approximate R sub f lues were 0.7 and 0.8. The accuracy of the quan- tion cannot be determined because of the dif- rences between the peak patterns produced by oclor 1254 and the extracts. However, quanti- s estimated in this study seem to be in agree- nt with data obtained in similar studies on rine organisms. (Mortland-Battelle)
74-05301

ELD IONIZATION MASS SPECTROMETRY: NEW TOOL FOR THE ANALYTICAL EMIST,
nford Research Inst., Menlo Park. Calif.
M. Anbar, and W. H. Aberth.
Analytical Chemistry, Vol 46, No 1, p 59-64, January 1974. 9 fig, 11 ref.

Descriptors: *Mass spectrometry, *Spectrophtometry, Ionization, Tracers, Isotope studies, Oil, Chemical analysis.
Identifiers: Field ionization, *Molecular tracers, Isotope dilution, No. 6 fuel oil, Oil characterization, Methaqualone, Phenobarbital, Norchlorpromazine.

Multipoint field ionization sources developed in recent years are discussed in detail and some new applications of mass spectrometry made possible by field ionization are reviewed. This technique provides nonfragmented and isotopically nonscrambled mass spectra which will open up at least two important areas of application: (1) analysis of complex multicomponent mixtures without preparation and (2) isotope dilution analysis by use of multilabeled molecular tracers. Field ionization spectra are shown for methaqualone, phenobarbital, norchlorpromazine, and No. 6 fuel oil. Field ionization mass spectrometry promises to provide a powerful tool in a diversity of fields including environmental research. (Mortland-Battelle)
W74-05302

GRADIENT TITRATION-A NOVEL APPROACH TO CONTINUOUS MONITORING USING ION-SELECTIVE ELECTRODES,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-05303

INVESTIGATION OF THE FACTORS AFFECTING THE RESPONSE TIME OF A CALCIUM SELECTIVE LIQUID MEMBRANE ELECTRODE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-05304

ANODIC STRIPPING VOLTAMMETRY OF ZINC IN SEAWATER WITH A TUBULAR MERCURY-GRAPHITE ELECTRODE,
Naval Undersea Center, San Diego, Calif. Chemical Oceanography Branch.
S. H. Lieberman, and A. Zirino.
Analytical Chemistry, Vol 46, No 1, p 20-23, January 1974. 5 fig, 2 tab, 14 ref.

Descriptors: *Zinc, *Sea water, *Pollutant identification, Water analysis, Trace elements, Heavy metals, Chemical analysis, Measurement, Flow rates, Cadmium, Lead, Copper, Instrumentation.
Identifiers: *Anodic stripping voltammetry, *Tubular mercury-graphite electrodes, Detection limits, Precision, Accuracy, Mercury graphite electrodes, Reproducibility.

A tubular mercury-graphite electrode (TMGE) has been used to measure zinc in flowing solutions by anodic stripping voltammetry. Fabrication of the electrode and a new method of applying and maintaining a consistently active mercury thin film on a graphite electrode are described. Application of the TMGE to anodic stripping voltammetry of Zn in seawater yields peak currents that are linear with concentration. Measurements are reproducible with a relative standard deviation of plus over minus 9.5 percent at the 0.3 nM level. The system is more sensitive than a comparable static system. Five-minute analysis times permit detection of zinc in sea water at concentrations of 1 nM. The Zn peak current and trace metal peak potentials are described as a function of plating time, rate of solution flow, and other variables. (Holoman-Battelle)
W74-05305

CHARACTERIZATION OF WOOD-PRESERVING COAL-TAR CREOSOTE BY GAS-LIQUID CHROMATOGRAPHY,
Forest Service (USDA), Madison, Wis. Forest Products Lab.
F. H. M. Nestler.
Analytical Chemistry, Vol 46, No 1, p 46-53, January 1974. 3 fig, 6 tab, 12 ref.

Descriptors: *Creosote, *Wood preservatives(Pesticides), *Coal tar coating, Physical properties, Gas chromatography, Aromatic compounds, Organic compounds, Methodology, Distillation, *Chromatography.
Identifiers: Characterization, *Gas liquid chromatography, Retention time, Aromatic hydrocarbons, Precision, Boiling point, Naphthalene, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyls, 2 6-Dimethylnaphthalene, 2 3-Dimethylnaphthalene, Carbazole, Acridine, Acenaphthene, Dibenzofurans, Fluorene, Phenanthrene, Anthracene, 2-Methylanthracene, 9-Methylanthracene, 2-Phenylnaphthalene, Fluoranthene, Pyrene, 2 3-Benzofluorene, Chrysene, n-Eicosane.

Six whole coal-tar creosotes, two of which represent contemporary commercial production, were analyzed by GLC on an SE-30 packing. Retention data for 14 standard compounds were determined for the four liquid phases: SE-30, ApL, OV-17, DEGS. The linear relationship observed between log relative retention in SE-30 and atmospheric boiling point permitted the quantitative interpretation of isothermal chromatograms in terms of a simulated distillation analysis. The latter results agreed very well with precision fractional distillation data, but much less so with the American Wood-Preservers' Association Standard Method. The boiling ranges selected for comparison of the three sets of data were those established for the AWPA Standard Method. (Holoman-Battelle)
W74-05306

USE OF MULTIPLE R SUB F VALUES FOR IDENTIFICATION BY PAPER AND THIN-LAYER CHROMATOGRAPHY,
Wisconsin Univ. Madison. School of Pharmacy.
K. A. Connors.
Analytical Chemistry, Vol 46, No 1, p 53-58, January 1974. 7 fig, 2 tab, 37 ref.

Descriptors: *Chromatography, *Solvents, Statistical methods, Pollutant identification.
Identifiers: R sub f values, Paper chromatography, Thin layer chromatography.

This paper attempts to define how many chromatographic solvent systems should be used in identifying unknowns and how these systems should be selected. Maximum information from chromatography for qualitative analysis is obtained when the R sub fx value for a compound in system X is independent of its value R sub fy in another system Y. It is found, for such systems, that the distribution of points in the R sub fx, R sub fy plane is closed to a Poisson distribution. The number of independent R sub f values required to identify a compound at a specified level of uncertainty can be calculated. Independence of R sub f values is enhanced by using chromatographic systems that are qualitatively different from each other. In many analytical situations, the analyst might make planned use of the considerations presented in this paper. A rough estimate of the size of the population can usually be made. The nature of the distribution of points in the R sub fx, R sub fy plane can be established experimentally, and application of the above guideline experimentally, and application of the above guideline may lead to efficient selection of uncorrelated systems. (Mortland-Battelle)
W74-05307

INDUCTIVELY COUPLED PLASMA-OPTICAL EMISSION ANALYTICAL SPECTROMETRY. A COMPACT FACILITY FOR TRACE ANALYSIS OF SOLUTIONS,
Ames Lab., Iowa.
R. H. Scott, V. A. Fassel, R. N. Kniseley, and D. E. Nixon.
Analytical Chemistry, Vol 46, No 1, p 75-80, January 1974. 8 fig, 3 tab, 35 ref.

Descriptors: *Heavy metals, *Aqueous solutions, *Laboratory equipment, *Trace elements, *Spectroscopy, Water analysis, Aluminum, Calcium, Cobalt, Chromium, Nickel, Lead, Titanium, Zinc.
Identifiers: Plasma-optical emission spectroscopy, Detection limits, Barium, Selenium, Vanadium, Yttrium, Trace levels.

This paper describes a compact inductively coupled plasma-optical emission system for the trace determination of metallic elements in solution. Theoretical considerations are presented to determine operating parameters which agree well with the empirically determined values. The aerosol desolvation system commonly used with this type of source has been eliminated, and pneumatic nebulization is employed in place of the more elaborate ultrasonic method. Some characteristics of the plasma are reported. Detection limits are in the range of 0.1-10 mg/ml for Al, Ba, Ca, Co, Cr, Ni, Pb, Se, Ti, V, Y, and Zn. The facility is readily adaptable to simultaneous multielement trace analysis. (Little-Battelle)
W74-05309

PRESERVATION OF DILUTE MERCURY SOLUTIONS,
Oak Ridge National Lab., Tenn.
C. Feldman.
Analytical Chemistry, Vol 46, No 1, p 99-102, January 1974. 9 fig, 1 tab, 9 ref.

Descriptors: Water storage, *Mercury, *Stability, Water analysis, Aqueous solutions, *Pollutant identification.
Identifiers: *Sample preservation, *Chemical loss, Reference samples, Losses.

Distilled water solutions containing 0.1-10.0 ng Hg/ml were stored for 10 days in glass and polyethylene containers. Those which were untreated, or treated with nitric acid, sulfuric acid plus potassium permanganate, or potassium chromate, lost substantial fractions of their mercury in this period. Solutions stored in polyethylene and treated with 5 percent (v/v) nitric acid plus 0.05 percent chromate ion stayed at full strength for at least ten days. Solutions stored in glass and treated with 5 percent (v/v) nitric acid plus 0.01 percent chromate ion stayed at full strength for as long as five months. The causes of losses in distilled and natural water samples are discussed. (Little-Battelle)
W74-05310

SOLVENT EXTRACTION OF METAL CHELATES INTO WATER-IMMISCIBLE ACETONE,
Kentucky Univ., Lexington. Dept. of Chemistry.
C. E. Matkovich, and G. D. Christian.
Analytical Chemistry, Vol 46, No 1, p 102-106, January 1974. 5 fig, 4 tab, 15 ref.

Descriptors: *Separation techniques, *Solvent extractions, *Aqueous solutions, *Heavy metals, Solvents, Water analysis, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Titanium, Chelation.
Identifiers: Scandium, *Metal, Chelates.

Acetone is separated from aqueous solutions via salting-out with either saturated calcium chloride or 65 wt percent sucrose. Several metal ammonium l-pyrrolidinecarbodithioate and dithizone chelates were successfully extracted from calcium chloride solutions into the acetone phase while metal oxine chelates were extracted from sucrose solutions. Solvent extraction curves are reported. The metals considered include Sc, Cr, Mn, Fe, Co, Ni, Cu, Ti, and Zn. (Little-Battelle)
W74-05311

ESTERIFICATION OF (2,4-DICHLOROPHENOXY)ACETIC ACID - A QUANTITATIVE COMPARISON OF ESTERIFICATION TECHNIQUES,
Saskatchewan Univ., Saskatoon. Dept. of Chemistry and Chemical Engineering.
J. Horner, S. S. Que Hee, and R. G. Sutherland.
Analytical Chemistry, Vol 46, No 1, p 110-112, January 1974. 2 tab, 11 ref.

Descriptors: *2 4-D, Gas chromatography, Nuclear magnetic resonance, Chemical analysis, *Chlorinated hydrocarbon pesticides, Herbicides, Methodology.
Identifiers: *Sample preparation, *Esterification, Purity, *Gas liquid chromatography, Mass spectra, Infrared spectra, NMR spectra.

Esterification of 2,4-D with BF3/alcohol mixtures for gas chromatography produces esters in greater than 90 percent yield in 20 minutes with few byproducts. Diazoalkylation is also efficient but produces many impurities. In addition, the reagent is more difficult to make and is more labile than the BF3/alcohol mixtures. Mineral acid catalysis of 2,4-D/alcohol mixtures is time consuming and inefficient. The esters produced by silylation are unstable. The purity of the ester was determined by GLC analysis with thermal conductivity, flame ionization, and electron capture detectors. Mass, infrared, and NMR spectra of the pure compounds were used to confirm the presence of the prepared esters, and the identity of collected compounds separated by thermal conductivity GLC. Retention times of the prepared esters were compared with those of authentic esters. (Little-Battelle)
W74-05312

EFFECTS OF SURFACTANTS ON ATOMIC ABSORPTION ANALYSIS OF DILUTE AQUEOUS COPPER AND NICKEL SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
R. L. Venable, and R. V. Ballad.
Analytical Chemistry, Vol 46, No 1, p 131-133, January 1974. 4 fig, 7 ref.

Descriptors: *Aqueous solutions, *Copper, *Nickel, Stabilization, Surfactants, Chemical analysis, Heavy metals, *Spectrophotometry.
Identifiers: *Anionic surfactants, Atomic absorption spectrophotometry, Absorbance, Sodium dodecyl sulfate, Sodium lauryl sulfate, Tetradecylpyridinium bromide, Critical micelle concentration.

Dilute (approximately 3 micrograms/ml) Cu and Ni solutions were analyzed by atomic absorption spectrophotometry upon the addition of the anionic surfactant, sodium dodecyl sulfate (SDS). One effect was the enhancement of absorption in acidic copper and nickel solutions containing SDS above the critical micelle concentration (CMC) over the same acidic copper and nickel concentrations without surfactant present. The second effect seemed to be either prevention of precipitate formation or stabilization of a colloidal dispersion in basic solutions at surfactant concentrations approaching and above the CMC. It was concluded that certain anionic surfactants can cause erroneus results in the AAS analysis of dilute aqueous metal ion solution. However, SDS and maybe other such surfactants can potentially be used to keep metals in solution where acidic pH values are not tolerable. (Holoman-Battelle)
W74-05313

DETERMINATION OF TRACE AMOUNTS OF C2-C5 ACIDS IN AQUEOUS SOLUTIONS BY GAS CHROMATOGRAPHY,
Rome Univ. (Italy). Istituto di Chimica Analitica.
A. Di Corcia, and R. Samperi.
Analytical Chemistry, Vol 46, No 1, p 140-143, January 1974. 4 fig, 1 tab, 14 ref.

Descriptors: *Aqueous solutions, *Gas chromatography, Separation techniques, Organic Acids, Water analysis, Distillation, *Pollutant identification.
Identifiers: *Fatty acids, Acetic acid, Propionic acid, Isobutyric acid, Butyric acid, 2-Methylbutyric acid, 3-Methylbutyric acid, Valeric acid, Flame ionization detector, Graphitized carbon black, Polyethylene glycol, Phosphoric acid.

An improved chromatographic method is reported for the rapid determination of aqueous solutions of the seven acids at concentrations down to 0.3 ppm using Graphitized Carbon Black (GCB) modified with appropriate amounts of H3PO4 and polyethylene glycol 20 M. Column packings were prepared by dissolving appropriate amounts of the two phases, H3PO4 and polyethylene glycol (PEG) 20 M (Carlo Erba), in methanol and coating on the GCB by a slurry technique. Methanol was removed with use of a heat lamp. While drying, stirring of these materials must be avoided, as it may cause in some measure crushing of the graphitized carbon particles. Dried materials were revieved to maintain the proper mesh range. Columns made from glass tubings whose dimensions are specified in the captions of the figures were packed by moderately vibrating with the aid of a vibrator. The first four centimeters of the inlet side of each column were left empty to use them as an expansion chamber for injected liquid samples. Columns were then conditioned for 24 hours at 240C. Using a suitably modified GCB surface allows quantitative determinations of C2-C5 acids to be made quite easily even at sub-ppm concentrations. The effect of adding PEG-20 M is twofold: first, it neutralizes residual 'hot sites' and, second, it reduces the surface area available for adsorption of eluate molecules, thus decreasing retention times. (Mortland-Battelle)
W74-05314

ANALYSIS OF PRIMARY AROMATIC AMINES AND NITRITE BY DIAZOTIZATION AND PYROLYSIS GAS CHROMATOGRAPHY,
Massachusetts Univ., Amherst. Dept. of Chemistry.
A. Savitsky, and S. Siggia.
Analytical Chemistry, Vol 46, No 1, p 153-157, January 1974. 3 tab, 13 ref.

Descriptors: *Gas chromatography, *Nitrite, *Aromatic compounds, Water analysis, Aqueous solutions, Pollutant identification.
Identifiers: *Aromatic Amines, *Diazotization, *Pyrolysis gas chromatography, Diazonium salt, Anisidine, Sodium sulfanilate, Metanilic acid, Anthranilic acid, Aminobenzoic acid, Benzidine, Diphenyl amine sulfonic acid, Methyl amine, Phenyl anthranilic acid, Triphenyl amine, Diethylamine, Accuracy, Precision, Chemical interference.

A pyrolysis gas chromatographic method for analysis of diazonium salts has recently been developed. Since only primary aromatic amines produce stable diazonium salts upon diazotization and only diazonium salts should liberate nitrogen upon mild pyrolysis, adaptation of the pyrolysis gas chromatographic method has been investigated as a specific method for measuring primary aromatic amine content of mixtures. The feasibility of the pyrolysis gas chromatographic technique was demonstrated by analysis of primary aromatic amines of known purity. The percent recoveries by pyrolysis indicate that diazotization proceeds quantitatively and that the manipulation of the diazonium salts preserves them for analysis. Low, though reproducible, results were obtained

or benzidine. Generally the precision and accura-y of the analysis was on the order of 1-2 percent. The analysis of mixtures for primary aromatic mine content was carried out by diazotizing in latinum boats. This was necessary because of in-olubility of the products of some secondary and ertiary aromatic amines. The ability of pyrolysis as chromatography to selectively determine the iazonium salts produced upon reaction with itrous acid was demonstrated. Analysis of nitrite n nitrate required special modification of the iazotization conditions. Anthranilic acid was hosen for diazotization because its diazonium salt as good water solubility. (Mortland-Battelle)
W74-05315

PATIAL VARIABILITY OF THE PRODUC-TIVITY: BIOMASS RATIO FOR PHYTOPLANKTON IN A SMALL MARINE BASIN,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5C.
W74-05316

BREEDING AND GROWTH OF THE CHAETOGNATH SAGITTA ELEGANS IN BEDFORD BASIN,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-05317

DAPHNIA DISTRIBUTION WITHIN LANG-MUIR CIRCULATIONS,
Freshwater Biological Association, Windermere (England).
For primary bibliographic entry see Field 5C.
W74-05318

ETTLING PLATES OF COLD-CURE ACRYLIC PLASTIC REPLICATED FROM NATURAL URFACES,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
M. J. Risk.
Limnology and Oceanography, Vol 18, No 5, p 01-802, September 1973. 10 ref.

Descriptors: *Plastics, *Sampling, *Artificial substrates, Algae, Invertebrates, Biological communities.
Identifiers: *Settling plates, Formatray, Acrylics, Colonizing.

Many different substances have been used in the ield and in the laboratory as substrates for olonizing communities of plants and animals. Formatray', a strong inert, cold-cure dental acryl-c, seems to satisfy most of the requirements of an deal settling plate material. Settling plates were nade by pouring mixed Formatray into latex ubber impressions of various surfaces. Latex im-ressions can successfully be made of almost any atural surface. Formatray has about 40 percent alcium carbonate filler material and chemically pproximates a calcareous sandstone or siltstone. virtually unlimited number of plates can be oured up from one latex impression, thus allow-ng the operator to place identical plates in dif-erent locations or a series of plates, chemically dentical and texturally different, in one location. n the field, plates are colonized rapidly and sup-ort heavy growths of algae and invertebrates. In a reliminary study in Big Fisherman's Cove, Santa Catalina Island, California, plates set out in shal-ow water picked up the most common algae set-ing on rocks in the area. So far, 41 species of lgae and at least 11 species of invertebrates have een identified growing on these plates; there eems to be no selective exclusion of groups. Mortland-Battelle)
W74-05319

PREPARATION OF FILTERED PLANKTON AND DETRITUS FOR STUDY WITH SCANNING ELECTRON MICROSCOPY,
California Univ., Davis. Inst. of Ecology.
H. W. Paerl, and S. L. Shimp.
Limnology and Oceanography, Vol 18, No 5, p 802-805, September 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Detritus, *Diatoms, *Electron microscopy, Dehydration, Filters, Lakes, Sea water, Sediments, Periphyton, Bacteria, Storage.
Identifiers: *Sample preparation, *Scanning electron microscopy, Sample preservation, Nuclepore filters, Lake Tahoe, Fixation.

A simple, rapid method of fixing plankton and detritus for the scanning electron microscope is described, which can be used in the laboratory or in the field. The sample is fixed with 2 percent glutaraldehyde followed by stepwise dehydration in increasing concentrations of ethyl alcohol. Fixed samples can be stored for up to 2 weeks. Critical point drying of the fixed samples is done in the laboratory. Nuclepore filters proved superior to other filters for most sample preparations. (Mortland-Battelle)
W74-05320

A SAMPLER FOR THE CHEMICAL ANALYSIS OF FRESHWATERS USING EVACUATED TUBES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 7B.
W74-05321

FISH VIRUSES: ISOLATION AND IDENTIFICATION OF INFECTIOUS HEMATOPOIETIC NECROSIS IN EASTERN NORTH AMERICA,
Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. Eastern Fish Disease Lab.
K. Wolf, M. C. Quimby, L. L. Pettijohn, and M. L. Landolt.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1625-1627, November 1973. 1 fig, 1 tab, 11 ref.

Descriptors: *Isolation, *Pollutant identification, *Fish diseases, Methodology, Testing procedures, *Rainbow trout, Viruses, Electron microscopy, Fish eggs, Fry.
Identifiers: *IHN virus, *Infectious hematopoietic necrosis, Histopathology, Salmo gairdneri, Plaque counts, Rhabdoviruses, Sample preparation.

Infectious hematopoietic necrosis virus (IHNV) was isolated from diseased fingerling rainbow trout (Salmo gairdneri) from a hatchery in West Virginia. Clinical signs, histopathologic findings, and origin of eggs provided a basis for diagnosis, and virus was isolated and presumptively identified by plaque characteristics. Serum neutralization tests provided positive identification of the agent as IHNV, and electron microscopy showed its rhabdovirus morphology. Experimental infections resulted in signs of IHNV and death; test fish had characteristic histopathologic alterations and appropriate virus titers. This is the first completely documented occurrence of IHNV beyond the Pacific Northwest. (Holoman-Battelle)
W74-05322

MICROCULTURES OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) CELLS: THEIR USE IN QUANTITATION OF CHANNEL CATFISH (ICTALURUS PUNCTATUS) VIRUS AND ANTIBODY,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
J. B. Gratzek, M. H. McGlamery, D. L. Dawe, and T. Scott.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1641-1645, November 1973. 2 fig, 3 tab, 9 ref.

Descriptors: *Cytological studies, *Assay, *Pollutant identification, Viruses, Channel catfish, Biochemistry, Fish diseases, Pollutants.
Identifiers: *Microculture methods, *Channel catfish virus, *Quantitative analysis, Brown bullhead, Cell cultures, Ictalurus nebulosus, Ictalurus punctatus, Antibodies, Plaque titration, Herpesviruses.

A microculture system was applied to the culture of brown bullhead (Ictalurus nebulosus) cells and used for the titration of channel catfish (Ictalurus punctatus) virus and corresponding antibody. As few as 17,000 cells/well could be used for routine titrations. Simultaneous inoculation of virus with cells at the time of planting resulted in clearer endpoints as opposed to inoculation of performed monolayers. When channel catfish virus antibodies were measured using plaque reduction and microculture titration assays as indicator systems, no significant differences in antibody titers were noted. (Holoman-Battelle)
W74-05323

PARAFFIN HYDROCARBON PATTERNS IN PETROLEUM-POLLUTED MUSSELS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. C. Clark, Jr., and J. S. Finley.
Marine Pollution Bulletin, Vol 4, No 11, p 172-176, November 1973. 4 fig, 1 tab, 9 ref.

Descriptors: *Marine animals, *Pollutant identification, *Oil pollution, Chemical analysis, Mussels, Organic compounds, Mollusks, Invertebrates, Bottom sampling, Gas chromatography, Separation techniques, Methodology, Baseline studies, Water quality.
Identifiers: *Trace levels, *Paraffins, *Petroleum hydrocarbons, Sample preparation, Data interpretation, Background levels, Hydrocarbons, Aliphatic hydrocarbons, Macroinvertebrates, Mytilus edulis, Mytilus californianus, Crude oil, Lubricating oil, No. 2 fuel oil, Fuel oil.

This paper describes how an analysis of the n-paraffin content and pattern can be used to delineate the accumulation of petroleum hydrocarbons in nature below levels of detectable odour or taste. It is possible to detect very low levels (less than 5 ppb individual n-paraffins n-14C3OH to n-37C76H) of paraffin hydrocarbons in intertidal marine organisms and to use these compounds with suitable baseline information for estimating the quantity of petroleum pollution uptake in the organisms. Under conditions of moderate to major oil pollution, this technique provides a calculation of residual paraffin hydrocarbon pattern in exposed organisms which can be compared to the pollutant hydrocarbon pattern. For low-level persistent pollution, the use of paraffin hydrocarbon patterns and content can often provide an indication of petroleum uptake but, in cases where the pollutant is low in paraffin hydrocarbons (lubricating oils, some crude oils, etc.) or where the rate of bacterial degradation is equivalent to the pollutant input different techniques of analysis are required. Exposed mussels (Mytilus spp.) collected under three differing degrees of suspected petroleum pollution are compared with unexposed control mussels: (1) 'high-level' pollution where a known pollutant was released in a single large discharge; (2) 'moderate-level' pollution where observable quantities of a known pollutant leaked over a long period; and (3) 'low-level persistent' pollution having multiple sources but no continuously visible oil slick on the water surface. (Holoman-Battelle)
W74-05326

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05328

DIRECT COUNTS AND PLATE COUNTS OF BACTERIA IN THE DANUBE BETWEEN BERG SPRING AND ULM (IN GERMAN),
Staatl Institut fuer Seenforschung und Seenbewirtschaftung, Langenargen (West Germany).
J. Deufel.
Arch Hydrobiol Supple, Vol 44, No 1, p 1-9, 1972, English summary.
Identifiers: *Bacteria, *Germany(Danube River), *Sewage, Plate counts, Direct counts, Pollutant identification.

In the Berg Spring, and at 7 other stations of the Danube above Ulm, the number of bacteria counted by the direct method, and the number of heterotrophic, saprophytic bacteria were determined. Highest numbers could always be found during low water level below the outfalls of sewers. With the microscopic method numbers ranged from 1900/ml at Berg Spring to 36,000,000/ml at Tuttlingen, and with the plate count method from 49/ml to 640,000/ml at the same stations. The ratio direct count to plate count can be employed only with reservation to indicate the water quality. In spite of a high concentration of bacteria, the bacterial load is smallest at low water-level and highest during floods. Along the section of river investigated the bacterial load increases parallel to the rising flow.--Copyright 1973, Biological Abstracts, Inc.
W74-05362

THE DETERMINATION OF COBALT IN FISH TISSUE BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Government Vitamin Lab., Bergen (Norway).
K. Julshamn, and O. R. Braekkan.
Atomic Absorption Newsletter, Vol 12, No 6, p 139-141, November-December 1973. 2 fig, 2 tab, 34 ref.

Descriptors: *Cobalt, *Chemical analysis, *Fish, Trace elements, Heavy metals, Freeze drying, Hydrogen ion concentration, *Spectrophotometry.
Identifiers: Animal tissues, *Atomic absorption spectrophotometry, Sample preparation, Chemical recovery, Detection limits, Precision, Ballan wrasse, Saithe, Sand eels.

A method is described for the determination of cobalt in fish. The samples were prepared for analysis by freeze-drying and homogenization. A portion of 10 g was pre-ashed with infrared heat and then ashed in a muffle furnace at 480C. The residue was dissolved in 0.1 N hydrochloric acid, chelated with ammonium pyrrolidine dithiocarbamate, extracted with methyl isobutyl ketone, and analyzed by atomic absorption spectroscopy. Levels down to 0.01 microgram cobalt per g of fish tissue may be estimated with an average recovery of 96 percent and a coefficient of variation of 5.7-14.2 percent. (Holoman-Battelle)
W74-05399

ACETYLENE-REDUCTION ASSAY OF ANAEROBIC NITROGEN FIXATION BY SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-05400

5B. Sources Of Pollution

TRACE SOLUABLE ORGANIC COMPOUNDS IN POTABLE WATER SUPPLIES,
Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04855

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
D. E. Kidd, G. V. Johnson, and J. D. Garcia.
Available from National Technical Information Service as PB-228 587 $9.50 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute Report 035, University of New Mexico, Albuquerque, 1974, 125 p, 26 tab, 3 fig, 84 ref. OWRR A-040-NMEX(2).

Descriptors: *New Mexico, *Ecosystems, *Trophic levels, *Mercury, *Fish, Aquatic animals, Food chains, Fish diets, Zooplankton, Turtles, Crayfish, Freshwater fish, Bass, Channel catfish, Laketrout, Carp, Suckers, Walleye, Perches, Mussels, Organic matter, Spectrophotometry.
Identifiers: *Mercurials, *Elephant Butte Reservoir(N. Mex.), Bioamplification, Freshwater mussels, Nonvascular plants, Organic debris.

Samples from Elephant Butte Lake collections were analyzed for mercury by a flameless atomic absorption procedure. Analyses revealed mean ppb mercury concentrations of 0.027 in water, 57 in bottom sediments, 109 in phytoplankton, 277 in attached algae and bryophytes, 95 in plant debris, 69 in zooplankton, 90 in crayfish muscle, 26 in visceral mass of mussels, 97 in muscle of non-predaceous fish, 125 in muscle of small predaceous fish, 253 in muscle of large predaceous fish, and 266 in muscle of two turtle species. Tissue grouped by relative levels for the sixteen fish species show consistently lower levels in bone, skin, gills, and eyes; intermediate levels in stomach, intestine, heart, and brain; and higher levels in spleen, muscle, kidney, and liver. General bioamplification at higher trophic levels appears to be diet related, but the relationship does not hold for lower trophic levels. Mercury levels in water indicate a decreasing gradient from inlet to dam, while sediments display an increasing gradient from inlet to dam. An attempt is made to account for concentrations in some higher trophic level species. Evidence suggests that mercury levels are related to seasonal conditions. A bioamplification scheme and concentration factors are presented which describe the status of mercury concentrations in existing trophic levels. The potential hazards of Elephant Butte fish to human health are discussed. (Hain-New Mexico)
W74-04859

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
R. W. Hill, E. K. Israelsen, and J. P. Riley.
Available from National Technical Information Service as PB-228 650 $4.75 in paper copy, $1.45 in microfiche. Report PRWG104-1, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, November 1973. 122 p, 18 fig, 3 tab, 54 ref, 6 append. OWRR B-065-Utah(1). 14-31-0001-3658.

Descriptors: *Simulation analysis, Management, *Salinity, *Forecasting, *Hydrologic systems, *Model studies, *Dissolved solids, Discharge(Water), Hydrology, Pollutants, Surface-groundwater relationships, *Utah, Water pollution, Surface waters, Water sampling, Data processing.
Identifiers: Dissolved solids models, Bear River basin(Utah).

Modeling concepts of the hydrologic system are based upon the development of basic relationships describing the hydrologic processes which are linked together by the continuity-of-mass principle. The salinity flow system is then linked to the hydrologic system based on the assumption that the various hydrologic processes change the chemical concentration in the system by storing, concentrating, diluting, and/or picking up additional salts. These processes are identified specifically for irrigated soils and for small storage reservoirs. The amount of storage dilution, concentration or additional pickup is specified during verification of the model. The system response is then used to predict future responses resulting from additional water resource uses. In this study the model was synthesized on the hybrid computer and applied to the Cache Valley subbasin of the Bear River basin. The ability of the model to predict increased salt concentrations is demonstrated. A method for estimating and filling data gaps is also briefly discussed.
W74-04860

CONFIRMATION OF HEXACHLOROBENZENE BY CHEMICAL REACTION,
Institut National de la Recherche Agronomique, Versailles (France).
For primary bibliographic entry see Field 5A.
W74-04871

RESPIRATION OF A SUBLITTORAL COMMUNITY,
Woods Hole Oceanographic Institution, Mass.
K. L. Smith, Jr.
Ecology, Vol 54, No 5, p 1065-1075, Late Summer 1973. 4 fig, 3 tab, 39 ref.

Descriptors: *Respiration, Biological communities, *Littoral, *Marine animals, Marine bacteria, *Seasonal, Biomass, Benthic fauna, Sediments, Crustaceans, Mollusks, Dominant organisms, Annelids, Oxidation, Bottom sampling, Marine plants, Water temperature, Salinity, Dissolved oxygen, Carbon, Soil temperature, Aquatic soils, Invertebrates, Animal metabolism, Clams, Cores, Chemical reactions, *Georgia.
Identifiers: Sublittoral, *Oxygen consumption, Species diversity, *Sapelo Island(Geo), Species abundance, Nemerteans, Coelenterates, Sipunculids, Echinoderms, Hemichordates, Pogonophorans, Species density, Meiofauna, Species diversity index, Shannon-Weiner diversity index, Sample preparation, Correlation coefficients, Polychaetes, Anthozoans, Notomastus, Glycera dibranchiata, Nephthys picta, Mellita quinquiesperforata, Haliactus, Decapods.

Respiration of a sublittoral community was examined off Sapelo Island, Georgia, from July 1969 through July, 1970. Total community respiration ranged from 53.7 ml 02/sq m/hr in January to 92.7 ml 02/sq m/hr in July. A positive correlation was found between community respiration and water temperature. Annual community respiration was estimated to be 676.6 liters 02/sq m/yr. The macrofauna consisted of 103 species representing ten phyla. Species abundance ranged from 744 individuals/sq m in July to 14,213 individuals/sq m in March. Biomass (ash free dry wt) increased from 7.3 g/sq m in October to 20.2 g/sq m in March. Macrofaunal respiration comprised from 5 to 26 percent of community respiration. Bacteria were the major functional component of the community accounting for 30 percent to 60 percent of the total respiration. Meiofaunal-microfaunal-microfloral respiration contributed from 25 percent to 58 percent of total community respiration. Sediment chemical oxidation was responsible for 2.8 m 02/sq m/hr in January to 8.5 ml 02/sq m/hr in July of the total oxygen uptake. (Holoman-Battelle)
W74-04874

ULTRASTRUCTURE OF THE GREEN ALGA DICHOTOMOSIPHON TUBEROSUS WITH SPECIAL REFERENCE TO THE OCCURRENCE OF STRIATED TUBULES IN THE CHLOROPLAST,
Illinois Univ., Urbana. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-04881

THE PRODUCTION OF HYDROGEN PEROXIDE BY BLUE-GREEN ALGAE: A SURVEY,
Texas Univ., Austin. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-04882

PECIES OF OCEANIC DINOFLAGELLATES N THE GENERA DISSODINIUM AND PYRO-YSTIS: INTERCLONAL AND INTERSPECIFIC OMPARISONS OF THE COLOR AND HOTON YIELD OF BIOLUMINESCENCE,
hode Island Univ., Kingston. Graduate School of ceanography.
. Swift, W. H. Biggley, and H. H. Seliger.
ournal of Phycology, Vol 9, No 4, p 420-426, ecember 1973. 2 fig, 4 tab, 54 ref.

escriptors: *Marine algae, *Dinoflagellates, Bioluminescence, Protozoa, Biological proper-es, Color, Speciation, Phytoplankton, Cultures, hemical analysis, Methodology, Carbon, itrogen, Plant growth.
entifiers: *Clones, *Bioenergetics, Photon yield, onyaulax spp, Pyrocystis acuta, Pyrocystis siformis, Pyrocystis noctiluca, Pyrodinium hamense, Dissodinium lunula, Luciferase.

n examination was made of the bioluminescence 5 clones of Dissodinium, 1 clone of Pyrocystis uta, 4 clones of Pyrocystis fusiformis, and 5 ones of Pyrocystis noctiluca. All clones oduced the same color bioluminescence with an tensity peak near 474 nm. The in vivo emission ectra of these clones agreed with those previ-sly determined for 4 other species of marine noflagellates. The amount of light emitted by the noflagellates in scotophase when mechanically imulated to exhaustion was determined for most the clones. The largest species, P. noctiluca and fusiformis, emitted 37-89 billion photons/cell d 23-62 billion photons/cell, respectively, about thousand times as much light as Gonyaulax spe-es. Pyrocystis acuta emitted 3-6 billion otons/cell. Three of the 5 clones of Dissodinium ere bioluminescent. The range for 3 clones was 13 billion photons/cell. All 5 clones of Dissodini-n are morphologically distinct. Both the clones Dissodinium and Pyrocystis produced much gher numbers of photons per cell nitrogen (ca. 7-) times) than Gonyaulax polyedra or Pyrodinium hamense. The data suggested that enzyme tur-ver occurred in the reactions producing light ring mechanical stimulation of Dissodinium and rocystis species. (Holoman-Battelle)
74-04883

HLOROPHYLL, NITROGEN, AND HOTSYNTHETIC PATTERNS DURING ROWTH AND SENESCENCE OF TWO BLUE-REEN ALGAE,
ueen's Univ., Kingston (Ontario). Dept. of iology.
or primary bibliographic entry see Field 5C.
74-04884

EGRADATION OF PARATHION BY BAC-ERIA ISOLATED FROM FLOODED SOIL,
entral Rice Research Inst., Cuttack (India). Dept. Soil Microbiology.
. Siddaramappa, K. P. Rajaram, and N. ethunathan.
pplied Microbiology, Vol 26, No 6, p 846-849, ecember 1973. 3 tab, 13 ref.

escriptors: *Alluvium, *Microbial degradation, Pseudomonas, Soil bacteria, Phosphothioate esticides, Nitrites, Isolation, Metabolism, Aero-c bacteria, Insecticides, Organophosphorus esticides, Biodegradation, Hydrolysis, *Path of ollutants.
dentifiers: *Parathion, *Bacillus, *Fate of pollu-nts, Chemical recovery, p-Nitrophenol, etabolites, Degradation products, Culture edia, Flooded soil.

acillus sp. and Pseudomonas sp. were isolated om parathion-amended flooded alluvial soil hich had demonstrated parathion-hydrolyzing ility. When Pseudomonas was incubated with 50 icrograms of parathion, 19 micrograms of p-trophenol was recovered within 4 h of incubation the hydrolysis product. After 20 h parathion was completely destroyed and no p-nitrophenol could be detected. When Pseudomonas was grown in a N2-free medium with p-nitrophenol as the sole carbon source, nitrite-nitrogen was released in proportion to the amount of p-nitrophenol degraded. Bacillus sp. was incubated as above with 166 micrograms of p-nitrophenol being metabolized, releasing 43 micrograms of nitrite. The bacterium failed to metabolize intact parathion to yield either nitrite or p-nitrophenol. (Holoman-Battelle)
W74-04889

COMPOSITION AND WASTE LOAD OF UNIT EFFLUENTS FROM A COMMERCIAL LEAFY GREENS CANNING OPERATION,
Georgia Univ., Experiment. Div. of Food Science.
For primary bibliographic entry see Field 5A.
W74-04904

CHARACTERISTICS OF PHOSPHORUS DEFICIENCY IN ANABAENA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W74-04905

POPULATION CHANGES IN ENTERIC BACTERIA AND OTHER MICROORGANISMS DURING AEROBIC THERMOPHILIC WINDROW COMPOSTING,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 5D.
W74-04908

REPORT ON THE COMPOSITION OF OIL FROM THE REGION OF NEW HYDROCARBON UPWELLING IN THE SANTA BARBARA CHANNEL,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5A.
W74-04919

CURRENTS AROUND THE HAWAIIAN ISLANDS. A STUDY OF COASTAL CURRENTS IN RESPECT TO SEWAGE DISPOSAL,
Hawaii Inst., of Geophysics, Honolulu.
D. E. Avery, D. C. Cox, and T. Laevastu.
Report No 26, Interim Progress Report 1, January 1963. 22 p, 13 fig, 3 tab.

Descriptors: *Hawaii, *Currents(Water), Coasts, *Islands, Tides, Circulation, Reefs, Channels, Topography, *Waste disposal, *Path of pollutants, Data collections, Sewage disposal.
Identifiers: *Tidal currents, Littoral currents, Windward, Leeward.

As part of a larger study on the dispersal and transport of waste in coastal areas, this interim report deals mainly with currents. Data gathered during the summer and fall of 1962 are presented in the appendix. Subjects are: nature of tides around the Hawaiian Islands; behavior of tidal currents and their relation to tidal amplitudes; separation of coastal and offshore circulations; influence of depth of water and coastal topography on the coastal currents; currents inside reefs and in channels; surface currents on windward and leeward sides of the islands; change of currents with depth; and currents around sewer outfalls. (Sinha-OEIS)
W74-04925

A REVIEW OF ESTUARINE MODELING,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 2L.
W74-04929

ON THE MEASUREMENT OF TURBULENCE IN ESTUARIES,
Connecticut Univ., Groton. Marine Sciences Inst.
W. F. Bohlen.
In: IEEE Conference on Engineering in the Ocean Environment, San Diego, California, September 21-24, 1971. (IEEE Publication 71 C40-OCC) p 238-242, 1971. 18 ref.

Descriptors: *Estuaries, *Diffusion, Turbulence, *Environmental effects, Instrumentation, Models, *Path of pollutants, Tides, *Density stratification.
Identifiers: Bottom roughness.

Evaluation of the diffusion characteristics of an estuary requires an understanding of the turbulence structure and a measure of the range and variability of the eddy diffusion coefficients. Such data are of primary importance to investigators seeking to estimate possible environmental changes through predictive numerical or hydraulic models. A review is presented of the turbulence problem with particular emphasis on estuaries. Both spectral characteristics and spatial scales are considered and related to experimental procedures. Currently available instrumentation is reviewed and its performance criticized. Emphasis is placed on long-term reliability. Both Lagrangi-anhe summer, deposition is slight becuase of low runoff, southward littoral drift, and northwest winds. The well-mixed estuarine system also precludes the net transport of sediments into the tidal entrance and up the estuarine channel. (Sinha-OEIS)
W74-04933

SALINITY INTRUSION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04954

WATER QUALITY IN ALASKAN CAMPGROUNDS,
Alaska Univ., College. Inst. of Water Resources.
R. S. Murphy.
Available from the National Technical Information Service as PB-228 851, $9.00 in paper copy, $1.45 in microfiche. Report No. IWR-38, 1973. 108 p, 1 fig, 22 tab, 52 ref, 2 append. OWRR B-009-ALAS(1).

Descriptors: *Camping, *Recreational facilities, *Recreational wastes, *Water supply systems, Water quality, Water sources, Waste disposal, Water pollution sources, *Alaska, Potable water.
Identifiers: *Campgrounds.

An evaluation is presented of water quality in Alaskan Campgrounds using laboratory determinations and on-site evaluations. In general, ground water quality was excellent and surface water quality unacceptable for human consumption and total body contact recreation. The most pressing need was the provision of an approved drinking water supply for each campground. The environmental health aspects of campgrounds were found to be largely neglected. Many of the sewage systems are inadequate, resulting in pollution of the ground and surface water. Solid waste was stored and disposed of by unacceptable methods. Finally, many campgrounds are located in swampy areas or in areas subject to annual flooding. (Hartman-Alaska)
W74-04974

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. B. Muller, J. F. Battaile, L. A. Bond, and P. W. Lamson.
Available from the National Technical Information Service as PB-228 871, $12.50 in paper copy,

$1.45 in microfiche. Report No. 15, Natural Resource Systems Series, February 1973. 126 p, 26 fig, 17 tab, 22 map plates, 81 ref. OWRR A-999-ARIZ(3).

Descriptors: *Water quality, *Salinity, *Salt tolerance, *Saline water, Artesian aquifers, Agriculture, Groundwater recharge, Social impact, Economic impact, Hydrologic systems, Conductivity, *Arizona, Irrigation water, Crop response, Model studies, Water pollution sources.
Identifiers: *Safford Valley(Ariz).

Changes in groundwater quality averaging 0.13 millimhos electrical conductivity and 35 ppm chloride increase are documented between 1940 and 1972. The decrement in the water quality of the surficial aquifer is attributed to the interaction of four major mechanisms. Brine leakage from underlying artesian aquifers, natural recharge of the surficial aquifer by saline waters, recharge of the aquifer by concentrated agricultural waters, and lateral groundwater movement through saline lacustrine beds appear to be the major salt sources. A chemical thermodynamic computer model of recharge water quality, and the construction of iso-chemical maps from analyzed water samples show artesian aquifer leakage to be the significant contribution of salts to the system. An economic analysis of the Safford Valley, based on the modeling of a 'representative farm' analog, indicates that cotton will remain economical to produce on the basis of the projected salinity trends, for a significant time beyond the limits of prediction of the models employed. A sociologic analysis of the area, based on an extensive questionnaire survey, shows that although the local farmers are aware of the salinity problems in the area they are not greatly concerned by them. (Muller-Arizona)
W74-04976

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
Y. C. Rogers.
Available from the National Technical Information Service as PB-228 874, $6.25 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 59 p, 7 tab, 3 fig, 38 ref. OWRR A-039-NMEX(3).

Descriptors: *New Mexico, *Ecology, Forestry, Lichens, Bacteria, Microorganisms, Biology, Fungi.
Identifiers: *Usnea tillandsioides, *Usnic Acid, Aboreal lichen.

The objectives were to obtain a measure of the amount of Usnea that falls to the forest floor; to determine if there is any difference between usnic acid production in the summer and the fall; to determine if rainwater is an important factor in leaching usnic acid out of lichen material; and to examine the effects of usnic acid upon soil microorganisms and germinating coniferous seedlings. Usnea tillandsioides, an aboreal lichen, was observed in great numbers on spruce and fir at an elevation of 11,200 feet in the Sangre de Cristo Range, New Mexico. The amount of fallen lichen material per hectare was estimated. Extractions from lichen thallus demonstrated that the quantity of usnic acid was less in summer lichens than in fall lichens. An examination of extracted rainwater did not indicate that usnic acid was being leached from lichens by rainfall. The small amount of usnic acid present in soil and litter samples suggested that decomposition of usnic acid must be taking place. Soil fungi and bacteria cultured in a liquid medium containing usnic acid allowed measurements and extrapolation of these organisms' ability to degrade usnic acid. Coniferous seeds were also subjected to usnic acid and compared for their ability to germinate and form roots under various concentrations. Further experimentation with young trees indicated that usnic acid may be extremely damaging when applied to roots in a concentration of 0.2 mg/ml ethyl acetate. (Creel-New Mexico)
W74-04979

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN NON-STRATIFIED TWO-DIMENSIONAL ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
For primary bibliographic entry see Field 2L.
W74-04983

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2K.
W74-05016

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
A. A. Ali-Zade, E. A. Daidbekova, P. A. Shoykhet, and G.-M. A. Aliyev.
Litologiya i Poleznyye Iskopayemyye, No 2, p 30-40, March-April 1973. 2 fig, 3 tab, 11 ref.

Descriptors: *Organic matter, *Organic compounds, *Sediments, *Carbonate rocks, *Mesozoic era, Recent epoch, Sedimentary basins(Geologic), Facies(Sedimentary), Oil, Petrology, Geochemistry, Water pollution sources.
Identifiers: *Caspian Sea, *USSR(Caucasus Mountains), Bitumens.

Distribution of organic matter was investigated in Recent sediments of the Caspian Sea and in Mesozoic rocks of the southeastern Caucasus. Carbonate sediments of enclosed sedimentation basins of the Caspian Sea type exhibit secondary formation of bitumens and hydrocarbons. This process involves both the shallow-water and deep-water facies of the region of present-day carbonate sedimentation. A study was made to trace the lithological-geochemical conditions promoting oil formation in Mesozoic rocks of the southeastern Caucasus. (Josefson-USGS)
W74-05021

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
I. Yu. Lubchenko, and I. V. Belova.
Litologiya i Poleznyye Iskopayemyye, No 2, p 23-29, March-April 1973. 4 tab, 11 ref.

Descriptors: *Geochemistry, *Trace elements, Movement, Rivers, *Dissolved solids, *Suspended solids, Suspension, Turbidity, Colloids, Oxides, Sorption, Filtration, Particle size, *Path of pollutants, Pollutant identification.
Identifiers: *USSR(Black Sea basin).

A study was made of migration of Ti, Fe, Mn, P, Zr, W, Cr, Ni, V, Co, Cu, Pb, Mo, Ga, and Zn in rivers of the Black Sea basin in 1968. Suspended and dissolved solids were separated by filtration through F-5 bacterial filters. The filtrate obtained showed no signs of opalescence, indicating complete separation of the suspended materials, including colloids. Analysis of grain-size distribution of river-water suspensions showed no direct relationship between the content of a given fraction and the general turbidity of water. Topography of the catchment area had little effect on grain-size distribution of the suspensions. Ti, Zr, Cr, and V showed a distinct tendency to accumulate in coarser fractions and Mn, Fe, Ni, Cu, Mo, W, Pb, and Zn in finer fractions. The concentration of elements in solution depends on the general turbidity of water. The migration of elements in solution is affected by sorption processes. The importance of sorption is demonstrated by the removal of amorphous iron and manganese oxides from the samples. Modes of migration of the elements are determined not only by whether the particular element migrates in solution or in suspension but also by the element's sorption activity. (Josefson-USGS)
W74-05022

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
I. I. Volkov.
Litologiya i Poleznyye Iskopayemyye, No 2, p 3-22, March-April 1973. 6 fig, 4 tab, 52 ref.

Descriptors: *Geochemistry, *Trace elements, *Distribution patterns, *Sedimentology, *Bottom sediments, Bottom sampling, Inorganic compounds, Metals, Organic compounds, Organic matter, Recent epoch, Correlation analysis, Water pollution sources.
Identifiers: *USSR(Black Sea), Mediterranean Sea, Organic carbon, Oozes, Sapropel.

A study was made of the vertical distribution of Fe, Mn, Ti, P, Cu, Ni, Co, V, Cr, Mo, W, Zr, Sr, Ge, U, CaCO3, and organic C in deep-sea sediments of the Black Sea. The distribution of chemical elements observed in Black Sea sediments is the result of a complex and many-sided geochemical evolution of the basin from Neoeuxinian to Recent time. Unlike the Neoeuxinian deposits, the change in concentrations of elements in Old Black Sea and Recent sediments, reflected in their enrichment in CaCO3, organic matter, and the group of geochemically mobile elements and in their impoverishment in Mn and relatively immobile elements, is due to a number of factors. The most important factor is the weakening of the hydrodynamic regime, which, as a result of intensified differentiation and diminution of the sedimentation rate in deep-sea sediments, has led to change in the concentration of all elements in the observed direction. Additional factors include increased contents of organic matter in the sediments, occurrence of hydrogen-sulfide contamination in water of the Black Sea, and inflow of Mediterranean waters through the Bospor. (Josefson-USGS)
W74-05023

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
R. B. Johnson, Jr.
Available from NTIS as COM-72-11170, pr $3.00 in paper copy, microfiche $1.45. Completi Report for Period April 1966 - March 1970, J 1970. 136 p, fig, ref. NOAA 2-12-R.

Descriptors: Texas, *Animal habitats, Fisheri Ecology, *Coastal engineering, *Powerplan *Harbors, Levees, *Hurricanes, *Electric pow *Water pollution sources.
Identifiers: Gulf Coast, Ecosystems.

The following were studied: the effects of habi modification on the fishery ecology of Ce

Bayou, Texas; the effects of engineering projects on the ecology of Jones Bay, Texas; the effects of engineering projects on the ecology of Moses Lake, Texas; and the effects of habitat modification on the fishery ecology of Trinity Bay, Texas. Studies were set up to determine the extent and quality of nursery environment for commercial and recreational fishery species, and to examine related environmental features, before, during and following construction or habitat modification where possible. Various gear were used to sample the biota. Major types used were bag seines (minnow seines), bar seines, drag seines, otter trawls, marsh nets and plankton two nets. Other samples were taken with Ekman dredge, core tubes, and by hand. Hydrographic studies included sampling for salinity, temperature, turbidity and dissolved oxygen. (Sinha - OEIS)
W74-05038

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
J. G. Heidel.
Journal American Water Works Association, Vol 57, No 2, p 239-244, February, 1965. 1 fig, 2 tab, 3 ref.

Descriptors: Wells, *Water wells, Water sources, *Water supply, *Groundwater, Aquifer characteristics, *Iron bacteria, Pollutants, Corrosion, *Oxidation-reduction, *Dissolved oxygen, Hydrogen ion concentration, Pollutant identification.
Identifiers: *Salisbury(Md.), 'Red water', Well efficiency, Production decline.

In September 1962, U.S. Geological Survey was asked to appraise the water resources of the Salisbury, Md., area. The first phase of the study was concerned with an apparent iron problem in the city well field. The municipal supply is obtained from sixteen shallow wells drilled adjacent to Beaverdam Creek. The principal recharge of the producing aquifer, or water-bearing zone, is from surface water sources, including Beaverdam Creek and ponds in the creek created by low dams, and from precipitation that infiltrates the porous soil of the area. Many communities using ground water as their source of supply have reported problems that are similar in some respects to those of the Salisbury wells. Basically, the reported symptoms are that yields of the municipal wells have been decreasing; a thick coating of material resembling iron oxide has been observed on the interior of the pump discharge lines of some wells; periodic analyses of water samples from the wells have revealed increases in total solids; and there have been complaints from some water users that 'dirty' or 'rusty' water is coming from their taps. Several hypotheses for the problems were derived. The methods of investigation, results and conclusions are presented. (Hunt-NWWA)
W74-05078

EFFECT OF WATERSHED AREA OIL FIELDS ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
J. A. Hirsch.
Journal American Waterworks Association, Vol 56, No 11, p 1474-1480, November, 1964. 6 fig, 3 tab, 3 ref.

Descriptors: Wells, Oil wells, *Water quality, Water supply, Pollution, *Oil wastes, Saline water, *Flow augmentation, Hardness, Public health, Legislation, *Louisiana, Municipal water.
Identifiers: *Shreveport(La.), Cross Lake(La.), Brine production, Oil field pollution.

Shreveport has drawn its municipal water supply from nearby Cross Lake since January 1926. Its watershed covers 264 sq mi, 63 per cent lying in the western part of Caddo Parish, La., and 37 percent in the eastern part of Harrison County, Texas. In this drainage area are located two important oil fields that extend across the Texas-Louisiana border. As oil production grew in the Cross Lake runoff areas, the quality of the streamflow, as reflected in the salt concentration of the lake water, suffered. Clearly evident from official records is the increasing salt concentration, with recent levels above 150 ppm NaCl far exceeding earlier levels of 15-30 ppm. Waste petroleum brines are characteristically high in salt, with only insignificant amounts of other compounds commonly found in natural waters. The increasing values of the salt to alkalinity ratio establish oil well wastes as the pollutant. Shreveport's various sources of water supply are all intimately connected with the extent of oil well brine releases within their respective watersheds. Unless considerable reduction in the salinity of raw-water supplies is soon apparent, efforts will be required to enact sweeping mandatory regulations for injection. This practice has been adopted under state or federal insistence in other areas, some of them of far less importance than is a metropolitan water supply. (Hunt-NWWA)
W74-05079

GROUNDWATER IN PAPUA NEW GUINEA,
Geological Survey of Papua New Guinea, Port Moresby.
For primary bibliographic entry see Field 4B.
W74-05084

REPORT OF THE POLLUTION COMMISSION, PART II: COLLABORATION BETWEEN THE WATER AND OIL INDUSTRIES,
H. Jagger, and L. H. Brown.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p Z25-Z31, (1969). 4 ref.

Descriptors: *Water pollutant sources, Water pollution, *Water pollution control, Oil, *Oil spills, Oily water, Public health, Pipelines, *Oil industry.
Identifiers: *Great Britain.

Although public health and river pollution considerations have given rise to legislation relating to the discharge of harmful and obnoxious effluents over the past century, pollution of fresh water resources by oil is a relatively recent concern. The pipelines, from the mid-1950's, resulted in increased concern by water supply authorities that water pollution of considerable magnitude might result from the failure of one such line. This conference underscores the joint activities of the water and oil industries that have been useful in providing a better mutual understanding of the problems involved and in suggesting steps which are reducing the risks and consequences of pollution of water resources by oil. (Staplin-NWWA)
W74-05094

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
T. E. Larson.
Journal American Water Works Association, Vol 56, No 2, p 169-172, February 1964.

Descriptors: Wells, *Water wells, *Water supply, Water quality, Aquifer characteristics, *Groundwater pollution, Odor, Taste, *Water quality control, *Illinois, *Iron, Hydrogen sulfide, Chlorides.
Identifiers: *Galvanic corrosion, Galesville sandstone, Galena-Platteville formation.

Most problems in well water quality are inherent and not receptive to correction by any means other than external treatment. These problems are usually related to the natural hardness or iron content of the water from the aquifer or from one of the contributing aquifers. Perhaps the most annoying problems are due to the iron content of the water. At times the occurrence of such problems is inexcusable or may be condoned only because of lack of information or adequate interpretation of information. Another less frequently encountered but more objectionable problem is that of hydrogen sulfide in well waters. This 'rotten-egg' odor almost always demands treatment. Case studies of these problems, their causes and corrective measures taken in 3 aquifers are presented. It is concluded that in many cases the pollutants enter the well from outside the producing zone due to improper or nonexistent sealing; however, it should be remembered that preventive measures taken during construction are usually superior to and less costly than corrective measures. (Hunt-NWWA)
W74-05100

WORKBOOK OF THERMAL PLUME PREDICTION: VOLUME 1, SUBMERGED DISCHARGE,
Pacific Northwest Water Lab., Corvallis, Oreg.
M. A. Shirazi, and L. R. Davis.
Copy available GPO Sup Doc as EP1.23/2:72-0053, $1.75; microfiche from NTIS as PB-228 293, $1. 5. Environmental Protection Agency, Technology Series Report EPA-R2-72-005a, August 1972. 228p, 8 fig, 12 tab, 7 ref. EPA Project 16130.

Descriptors: *Jets, *Thermal pollution, Publications, *Discharge(Water), *Distribution patterns, Water pollution effects, Heated water, Forecasting, Water pollution sources.
Identifiers: Submerged jets, *Nomograms, *Thermal plumes, *Submerged discharge.

This workbook contains computational procedures in the form of nomograms designed to satisfy several needs related to the discharge of thermal waste into large bodies of water. They provide estimates of physical spread and temperature distribution around the discharge point for the assessment of biological and physical effects of heated water. They can be used as guidelines for setting temperature standards and for monitoring. Finally, they have utility in pre-design feasibility analyses and outfall performance estimates. Data and analyses from numerous sources constitute the backup material for this publication. An attempt has been made to unify and present the material in a format that is sufficiently simple for a non-specialist user. A number of illustrative examples are presented which demonstrate the use of each set of nomograms in practical problems. The status of analysis at this time is not sufficiently advanced to encompass a wide range of experimentally verified predictive models. For this reason, care must be exercised when applying the generalized nomograms to specific situations. The major restrictions for each set of nomograms are outlined in the text which the user is advised to review carefully. In general, the nomograms provide meaningful qualitative information for a wide range of problems of practical interest, but their use is subject to scrutiny and proper interpretation when applied to exacting design conditions. (EPA)
W74-05111

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05117

REGRESSION TECHNIQUES FOR ESTIMATION OF SULFATE IN STREAMS DRAINING AN AREA AFFECTED BY COAL MINING,
Geological Survey, Louisville, Ky. Water Resources Div.
H. F. Grubb, and P. D. Ryder.
In: Proceedings of 3rd Annual Environmental Engineering and Science Conference, March 5-6, 1973, Louisville, Ky: University of Louisville Speed Scientific School, p 127-137, 1973. 7 fig, 2 tab, 2 ref.

Descriptors: *Regression analysis, *Monitoring, *Sulfates, *Acid mine water, *Coal mines, Mine acids, Data processing, Statistical methods, *Kentucky.
Identifiers: *Tradewater River basin(Ky).

The Tradewater River basin above the U.S. Geological Survey stream-gaging station at Olney, Ky., has been extensively mined for coal by both underground and strip-mining methods. A relationship between specific electrical conductance (X) and sulfate concentration (Y) can be represented by a simple linear regression equation of the form $Y = a + bX$. The regression coefficients a and b were determined using data from 465 chemical analyses made over a 17-year period at the Olney Station. Reduction of the standard error of about 40% was achieved by removing 16 data points representing water anomalously high in bicarbonate and associated with rainfall and runoff from the western, nonmined portion of the basin. Sulfate concentration, estimated from specific conductance measurements and the relationships $\log Y = -1.015 + 1.242 \log X$, was compared to the sulfate concentration in 96 water samples collected from the Tradewater River at Olney since 1966. The maximum error of prediction was 26%, and 89% of the estimated values were within 10% of the observed sulfate concentrations. The long-term effects of coal mining on stream water chemistry can be monitored with specific conductance and only a limited number of chemical analyses to verify the stability of the sulfate-conductance relationship. (Knapp-USGS)
W74-05125

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 8B.
W74-05128

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2F.
W74-05147

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W74-05148

MICROBIAL DEGRADATION OF PETROLEUM IN CONTINENTAL SHELF SEDIMENTS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
P. G. Hunt, F. R. Koutz, R. P. Murrmann, and T. G. Martin.
Special Report 196, December 1973. 16 p, 5 fig, 2 tab, 38 ref, append.

Descriptors: *Oil spills, *Contential shelf, *Biodegradation, *Path of pollutants, Bottom sediments, Oil pollution, Aerobic conditions.

A study was conducted to determine whether petroleum waste products deposited in surficial sediments of the United States Continental Shelf would be subject to microbial degradation. Degradation of these waste products should occur under the aerobic conditions commonly present in the sediments, but under anaerobic conditions, degradation of hydrocarbons should be extremely slow. It was verified, using carbon-14 labeled hydrocarbons, that degradation of petroleum in sediments occurs when oxygen is very limited; however, several hundred years would be required for complete degradation to occur. (Knapp-USGS)
W74-05153

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-05156

ENVIRONMENTAL ACTIVITIES AND PROGRAMS AT THE SAVANNAH RIVER PLANT.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
Available from NTIS, Springfield, Va., as Rept. No. DPST-73-436, $4.00 per copy, $1.45 microfiche. Report No. DPST-73-436, Sept. 1973. 23 p.

Descriptors: *Environment, *Monitoring, *Radioactivity, Rivers, *Nuclear powerplants, Nuclear wastes, Effluents, Streams, Administration, Standards, Regulation, Water pollution safety, Public health, Ecology, Forests, Limnology, Meteorology, Fuel, Fabrication, Radioactive waste disposal, Food chains, Transport depletion, *South Carolina.
Identifiers: *Savannah River(So Car).

The Savannah River Plant consists of three operating nuclear production reactors, two separations areas for processing irradiated materials, a heavy water extraction and recovery plant, reactor fuel fabrication facilities, the Savannah River Laboratory (a process development laboratory to support production operations), and the many non-nuclear facilities necessary for plant operations. The purpose and operation of the plant activities and the funded programs to modify the impact of potential or actual releases to the environs are described. Inasmuch as the plant processes are quite complex, this report does not describe any of the activities in depth nor does it delineate in detail the results of the various emission controls, environmental research, and environmental monitoring programs. Rather, the report gives general descriptions of these activities. For fiscal year 1974, the operating budget for the plantsite is about $125 million; about 10% of this amount is spent for environmentally oriented activities. (Houser-ORNL)
W74-05173

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT, (HEALTH AND SAFETY LABORATORY, AEC, NEW YORK),
Health and Safety Lab. (AEC), New York.
For primary bibliographic entry see Field 5A.
W74-05174

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT - JUNE 1, 1973, THROUGH SEPTEMBER 1, 1973, APPENDIX,
Health and Safety Lab. (AEC), New York.
For primary bibliographic entry see Field 5A.
W74-05175

RADIOLOGICAL EVALUATIONS FOR AD VANCED WASTE MANAGEMENT STUDIES,
Battelle-Pacific Northwest Labs., Richland Wash.
D. H. Denham, D. A. Baker, J. K. Soldat, and J. P. Corley.
Available from NTIS, Springfield, Va., as Repo No. BNWL-1764. $5.45 per copy, $1.4 microfiche. Report No. BNWL-1764, Sept. 197 71 p, 7 fig, 22 tab, 28 ref, 6 append.

Descriptors: *Radioactive waste disposa *Nuclear powerplants, Effluents, *Air pollutio *Water pollution, Soil contamination, Manag ment, Regulation, Social aspects, Public healt Benefits, Cost-benefit analysis, Cost-benef theory, Radioisotopes, Strontium, Cesium, Mod studies, Mathematical models, *Computer model

The overall risk evaluation for various radioacti waste management concepts includes calculatio of radiation doses to individuals and local popul tions. Radiation doses are the most appropria measure of the consequences of unforesee releases of radioactive materials to the enviro ment and dose criteria are available by which t severity may be judged. A comprehensive do computational model, developed and used f other Atomic Energy Commission studies, h been adopted to improve its flexibility and to ass in evaluating alternative means for disposal high-level waste. Typical input terms for norm use include source terms (radionuclide relea rates to man's immediate environment) and di tion factors. Outputs include individual pathw doses and total doses to maximum individuals both an urban and a rural population. Whole bo doses plus doses to other critical organs are c tained, as well as the fractional dose contributio of individual nuclides. Doses for one year or to doses for fifty years of exposure are availab (Houser-ORNL)
W74-05176

ENVIRONMENTAL MONITORING. ANNU REPORT, 1972, (ATOMICS INTERNATIONAL
Atomics International, Canoga Park, Ca Health, Safety and Radiation Services Dept.
J. D. Moore.
Available from NTIS, Springfield, Va., as Re TID-26442, $4.00 per copy, $1.45 microfiche. port TID-26442, 1972. 27 p, 7 fig, 8 tab, 3 ref, 3 pend.

Descriptors: *Monitoring, *Environme *Background radiation, *Radiation, *Nuclear plosions, Safety, Toxicity, Public health, So Vegetation, Water, Air, Survey, Measurement.
Identifiers: *Weapons testing.

Environmental monitoring at Atomics Inter tional is performed by the Operational Safety Waste Management Unit of the Health, Safety Radiation Services Department. Soil, vegetati water, and air are routinely sampled up t distance of 10 miles from Atomics Internatio sites. Site perimeters are monitored for radiat levels by means of thermoluminescent dosimet The environmental radioactivity reported here attributed to natural causes and to nucl weapons testing, rather than to Atomics Inter tional operations. The environmental monito program provides a measure of the effectiven of the Company's radiological safety procedu and of engineering safeguards incorporated facility designs. (Houser-ORNL)
W74-05177

LOW-LEVEL RADIOACTIVITY MEASU MENTS,
National Bureau of Standards, Washington, D.
For primary bibliographic entry see Field 5A.
W74-05178

RADIOLOGICAL SURVEY OF THE AREA SURROUNDING THE ELK RIVER REACTOR, ELK RIVER, MINNESOTA.
EG and G., Inc., Las Vegas, Nev. Aerial Surveillance Dept.
Available from NTIS, Sprinfield, Va., as Rept. No. EGG-1183-1591, $4 per copy, $1.45 microfiche. Report No. EGG-1183-1591, May 1, 1973. 21 p, 3 fig, 3 tab, 3 ref.

Descriptors: Survey, *Radioactivity, *Measurement, *Air pollution, Water pollution, Water pollution sources, Soil contamination, Nuclear powerplants, Effluents, Public health, Remote sensing, *Minnesota.
Identifiers: *Elk River(Minn).

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Elk River experimental power reactor during August and September 1968. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 900 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background radiation. (Houser-ORNL)
W74-05179

GENERAL ENVIRONMENTAL SITING GUIDES FOR NUCLEAR POWER PLANTS -- TOPICS AND BASES, (DRAFT).
Directorate of Regulatory Standards (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05180

RADIONUCLIDES IN ECOSYSTEMS, VOLUME
Oak Ridge National Lab., Tenn.
Available from NTIS, Springfield, Va., as CONF-710501, Proceedings, Vol. 1, $13.60 per copy, $1.45 microfiche. Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, D. J. Nelson, Editor. Report CONF-710501-P1, (1971), 678p.

Descriptors: *Ecosystems, *Radioecology, Radioisotopes, Ecology, Radioactivity, *Path of pollutants, *Environmental effects, Assay, Measurement, Water pollution, *Monitoring.

Contents of volume I are divided into eight parts: Plenary Session Papers; Radionuclides in Terrestrial Ecosystems; Radionuclides in Freshwater Ecosystems; Thermal Effects Studies; Radionuclides in Marine Ecosystems; Models of Radionuclides in Ecosystems; Effects of Ionizing Radiation on Plants and Plant Communities; and Effects of Ionizing Radiation on Species and Populations. (See also W74-05182 thru W74-05212)
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
J. B. Platt, H. L. Ragsdale, and D. J. Shure.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971. Oak Ridge, Tennessee, (1971) p 9-17, 5 fig.

Descriptors: *Radioactivity, *Environment, Ecology, *Evaluation, Assay, *Measurement, Appraisals, Assessment, *Ecosystems, Quality Control, Forecasting, Balance of nature, Eutrophication, Food chains, Biota, Biorhythms, Computer programs, Data storage and retrieval, Meteorology, Hydrology.

Both a philosophy and a plan of action are presented for an ecosystem approach to the measurement and evaluation of radioactive nuclides in the environment. Methods currently in use are generally restricted to an analysis of those environmental components directly related to man. Yet man's welfare depends also on the long-range quality of his total environment. For example, it is becoming apparent that negative feedbacks to man originate in natural systems. Thus, the prediction and discovery of trends of environmental change must be based on the entire network of trophic and subsystem transfers. Irreversible environmental problems usually arise through couples among biotic subsystems. Reversals of potential threats to man are least expensively made by understanding and regulating inputs to natural systems. Changes become irreversible or expensively reversible when detected in food chains coupled directly to man. Food chains are treated functionally as natural, recreational, and domestic, with each of these assigned to the primary environmental components, including man. Computer programming provides for data storage, systems analysis of the data with respect to base lines and trends, and both tabular and graphic data displays. (See also W74-05181) (Houser-ORNL)
W74-05182

RADIONUCLIDES IN THE ENVIRONMENT AT NUCLEAR POWER STATIONS,
Environmental Protection Agency, Cincinnati, Ohio. Radiochemistry and Nuclear Engineering Branch.
B. Kahn.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 30-36, (1971), 1 fig, 4 tab, 10 ref.

Descriptors: *Radioactivity, *Environment, *Nuclear powerplants, Effluents, Ecology, *Radioecology, Monitoring, Ecosystems, Aquatic life, Air pollution, Water pollution, Public health, *Path of pollutants, Survey, Assay, Measurement, Food chains.
Identifiers: *Surveillance program.

The radionuclides that can be found in the environment of commercial nuclear power stations are indicated, problems of environmental surveillance are discussed, and topics of radioecological research in this area are suggested. The information on radionuclides in the environment is derived from radionuclide release data and routine environmental monitoring by the stations and from field studies at several stations. The results show that several radionuclides are readily detectable in the aquatic ecosystem at many or all stations. Measurement of radioactive gases in ground-level air at several stations can be used to determine dispersion of stack effluents in air. Little or no radioactivity from the stations has been found in the terrestrial ecosystem. (See also W74-05181) (Houser-ORNL)
W74-05183

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
L. R. Anspaugh, J. J. Koranda, and W. L. Robison.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 37-52, (1971) 5 fig, 10 tab, 58 ref.

Descriptors: *Environment, *Natural gas, *Secondary recovery(Oil), Benefits, Cost-benefit ratio, *Air pollution, Water pollution, Food chains, Public health, Food, Milk, Vegetation, Path of pollutants, Tritium, Krypton radioisotopes, *Radioecology, *Nuclear explosions, Computer models.
Identifiers: Project Rulison.

It is likely that future activities administered by the USAEC Division of Peaceful Nuclear Explosives will be in the area of underground engineering, and particularly in the stimulation of deeply buried natural gas reservoirs of low permeability. The successful development of this technology could double the proved recoverable resources of natural gas in the United States. During the developmental stage of the technology, large quantities of THO are released to the environment as the gas is withdrawn. Efforts to predict potential doses resulting from such releases have been severely handicapped by the lack of adequate data to predict the ecological movement of THO. A radio-ecological study was conducted in conjunction with Project Rulison, the second nuclear-stimulation experiment, to evaluate these parameters; controlled laboratory studies were also initiated. The results indicate that the environmental residence time of THO is at least an order of magnitude shorter than has been frequently assumed, and that this invalidates the commonly used deposition velocity approach for the calculation of doses due to food chain contamination by THO vapor. A simple but realistic model is developed based on these findings to predict the dose to man via the forage-cow-milk, forage-cattle-beef, vegetation, and inhalation pathways. The dose predicted by this model for the Rulison area residents is 10 to the third power to 10 to the fourth power lower than the preflaring estimates made by a variety of organizations. (See also W74-05181) (Houser-ORNL)
W74-05184

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
S. Strauch.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 53-62, (1971) 15 fig.

Descriptors: *Nuclear powerplants, *Radioactivity, Effluents, *Environment, Assessment, *Forecasting, River basins, Mississippi River, Missouri River, Ohio River, Lake Michigan, *Path of pollutants, Food, Water, Food chains, Population, Public health, Computer programs, Model studies, *Computer models.

A study was initiated by AEC in January 1970 to develop a computer model and necessary data to permit estimates of potential doses and dose commitments to individuals and population groups as a result of selected release rates from reactors and fuel reprocessing plants in a large geographic region. The model is of the sophistication warranted for 30 years forecasting purposes and of sufficient generality and scope to permit it to eventually encompass the contiguous United States. The study is being conducted by the Hanford Engineering Development Laboratory at Richland, Washington, with the assistance of Battelle Memorial Institute under the direction of the AEC Division of Reactor Development and Technology and the Director of Regulation. The model is being applied initially to the Upper Mississippi River Basin for the nuclear facilities which are projected to be located in that region by the year 2000. Exceptional care is being taken to ensure that all radionuclides and their associated pathways that lead to significant doses are included in this initial development phase of the model. (See also W74-05181) (Houser-ORNL)
W74-05185

AEC IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT IN ITS LICENSING AND REGULATION OF NUCLEAR FACILITIES,
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05186

GAMMA-EMITTING RADIONUCLIDES IN ALASKAN ENVIRONMENTS 1967-1970,
California Univ., Livermore. Lawrence Livermore Lab.
J. J. Koranda, and J. R. Martin.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 81-107, (1971) 5 fig, 19 tab, 23 ref.

Descriptors: *Environment, *Sampling, *Radioactivity, *Assay, *Measurement, Evaluation, Safety, Air pollution, Water pollution, Soil contamination, Vegetation, Lichen, Fallout, Cesium, Nuclear explosions, Radioisotopes, *Alaska.
Identifiers: China, *Amchitka Island(Alas).

Environmental samples were collected at several sites in Alaska to determine the present status of radionculides in Alaskan environments, with special emphasis on Amchitka Island. Samples were obtained on Amchitka Island, the coastal Alaska near Anchorage, and in central Alaska in the Fairbanks area. Lichens, grasses, herbs, and shrubs were collected along the Amchitka Island to Fairbanks transect of Alaskan environments. Radionuclide concentrations were determined by scintillation crystal and solid-state gamma spectroscopy. Cesium-137 was the most abundant radionuclide found in the northern environments, with low but detectable concentrations of Eu-155, Sb-125, Ce-144, and Mn-54 also being present. Fallout from recent Chinese tests produced increased levels of Zr-95/Nb-95 in the 1970 samples. Lichens have the highest concentrations of Cs-137, but evergreen vascular plants also had Cs-137 concentrations in the same range as those found in lichens. Plants with an annual topgrowth, such as grasses, had low to nondetectable concentrations of radionuclides. These data describe radiometric base lines pertinent to current testing programs being conducted in the Aleutian Islands and relate those base lines to those occurring elsewhere in the high latitudes. (See also W74-05181) (Houser-ORNL)
W74-05187

RECENT MEASUREMENTS OF CESIUM-137 IN RESIDENCE TIME IN ALASKAN VEGETATION,
California Univ., Livermore. Lawrence Livermore Lab.
J. R. Martin, and J. J. Koranda.
In: CONF-710501-P1, Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 108-115, (1971) 5 fig, 1 tab, 25 ref.

Descriptors: *Monitoring, *Measurement, *Cesium, *Vegetation, *Lichens, Ecology, Ecosystems, Water pollution, Fallout, Sampling, Assay, Data collections, Radioecology, Absorption, Cycles, Food chains, Public health, Radioisotopes, *Alaska, *Path of pollutants.
Identifiers: Residence half-time, Aleutian Islands(Alas), Anchorage(Alas).

Radionuclide concentrations in Alaskan plant species were measured in the period 1967-1970 when incoming fallout was a small fraction of the accumulated inventory present in the vegetation. Samples were collected in five geographic areas from the western Aleutians to the interior of Alaska. Radionuclide concentrations in 150-g aliquots of dried, ground, and compressed samples were measured by scintillation gamma spectrometry. The residence half-time for Cs-137 in Cladonia sp. lichens was approximately three years on Amchitka Island and the coastal area near Anchorage, Alaska. In central Alaska near Fairbanks and in the mountains near Anchorage, the residence half-time for Cs-137 in lichens was about eight years. Evergreen vascular plants from these higher elevation sites had residence half-times of only one to three years. (See also W74-05181) (Houser-ORNL)
W74-05188

RADIONUCLIDE BIOMAGNIFICATION IN COASTAL-PLAIN DEER,
Georgia Univ., Athens. School of Forest Resources.
J. H. Jenkins, and T. T. Fendley.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 116-122, (1971) 5 fig, 4 tab, 14 ref.

Descriptors: *Monitoring, Measurement, *Radioisotopes, *Cesium, *Strontium, *Deer, Southeast region, Fallout, Water pollution, Absorption, Food chains, Public health, Radioecology, Vegetation, Bioindicators, Biology, Bioassay, Atlantic Coastal Plain, Gulf Coastal Plain.
Identifiers: *Bioaccumulation.

Muscle samples have been obtained from over 1000 deer throughout the Southeast during the past five years and analyzed for radionuclides. Deer from the Lower Coastal Plain region had consistently higher levels of Cs-137 than deer from the Upper Coastal Plain, Piedmont, Central Plateau, and Mountain regions. In the Lower Coastal Plain, deer muscle average 45,000 pCi/kg of Cs-137, with some specimens ranging up to over 150,000 pCi/kg. Animals from the other provinces averaged around 4000 pCi/kg. Evidence that Sr-90 is effectively transported through the Lower Coastal Plain environment also. Strontium values in deer were comparable to the values found in Arctic herbivores, while the Cs-137 values are higher than were found in the Arctic. Potassium deficiency in vegetation probably increases radionuclide bioaccumulation. Cropland vegetation is 20X higher in potassium and has only 1 to 3% as much radioactive cesium as forest and swampland vegetation. Bioaccumulation in wildlife may well become a classic example of radionuclide cycling. Data indicate that the sterile, sandy soils of the Lower Coastal Plain in combination with high water tables and some specific radionuclide-concentrating plants produce the conditions which result in biomagnification of Cs-137 and Sr-90 in deer. (See also W74-05181) (Houser-ORNL)
W74-05189

CESIUM-137 IN WHITE-TAILED DEER AS RELATED TO VEGETATION AND SOILS OF THE SOUTHEASTERN UNITED STATES,
Eastern Environmental Radiation Lab., Montgomery, Ala.
S. L. Cummings, J. H. Jenkins, T. T. Fendley, L. Bankert, and P. H. Bedrosian.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 123-128, (1971) 1 fig, 4 tab, 15 ref.

Descriptors: *Monitoring, *Measurement, *Cesium, *Deer, *Southeast U.S., Vegetation, Soils, Radioecology, Sands, Assay, Soil analysis, Leaching, Ion transport, Soil water, Absorption, Atlantic Coastal Plain, Gulf Coastal Plain.

Data are presented for Cs-137 in white-tailed deer and vegetation of the southeastern United States along with information as to the nature of the associated soils. The concentrations of Cs-137 in some of the vegetation were of sufficient magnitude to account for the Cs-137 concentrations found in the deer. The highest Cs-137 concentrations in deer were associated with the humic-gley soils along the Atlantic and Gulf Coasts. These soils are predominately sandy in nature and have relatively low fixing capacities. The concentrations of Cs-137 in the vegetation grown on the humic-gley soils under natural and controlled conditions were greater than from the gray-brown podzolic and red-yellow podzolic soils. (See also W74-05181) (Houser-ORNL)
W74-05190

DISTRIBUTION OF CESIUM-137 IN A SMALL WATERSHED IN NORTHERN MISSISSIPPI,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Ritchie, J. R. McHenry, A. C. Gill, and P. H. Hawks.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 129-132, (1971) 2 fig, 4 tab, 11 ref.

Descriptors: *Fallout, *Cesium, *Monitoring, Measurement, *Watersheds(Basins), *Mississippi, Distribution, Sediment distribution, Ecological distribution, Model studies, Hydrologic data, Hydrologic models, Movement, Diffusion, Dispersion, Transfer, Sediment transport, Entrainment, Path of pollution, Erosion.

Concentration of fallout Cs-137 in soils and sediments of a small watershed in north Mississipp was measured to determine the redistribution o fallout Cs-137. Measured concentration of Cs-13 ranged from 8.9 nCi/sq m in soils from actively eroding areas to 412.2 nCi/sq m in conservatio pool sediments. A model was constructed for th distribution of Cs-137 in the watershed. Sixty-on percent of the Cs-137 in the conservation poo sediments was derived from the movement of Cs 137 from the contributing watershed. Of the Cs 137 moved from the watershed, 53% was con tributed from the eroded areas which presently oc cupy 4% of the contributing watershed area. Th efficiency of the reservoir for trapping or retainin Cs-137 carried into it from runoff was 57%. Of th total Cs-137 deposited in the watershed, less tha 7% moved from the contributing watershed an only 3% of the Cs-137 deposited in the watershe moved through the reservoir outlets. (See als W74-05181) (Houser-ORNL)
W74-05191

A PROPOSED MECHANISM FOR TH RECYCLING OF RADIOCESIUM IN FLORID SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-05192

CESIUM-137 SOIL INVENTORY OF A TAGGE LIRIODENDRON FOREST 1962 AND 1969,
Oak Ridge National Lab., Tenn.
C. W. Francis, and T. Tamura.
In: CONF-710501-P1 - Proceedings of the Thi National Symposium on Radioecology, May 1 12, 1971, Oak Ridge, Tenn. p 140-149, (1971), 5 fi 9 tab, 14 ref.

Descriptors: *Cesium, *Absorption, *Soil *Radioactive tracers, *Tracking techniques, *Pa of pollutants, Absorption, Cycles, Forest, Fore soils, Root systems, Soil-water-plant relatio ships, Minerals, Sorption, Radioecolog Ecosystems, Ion exchange, Clays, Research a development.

The soil has become a major sink for Cs-137 noculated into Liriodendron in 1962. The distrib tion of this radionuclide within the soil profile a among soil fractions was determined in samplings of late fall 1962 and summer 1969. T much higher concentractions of Cs-137 in the cl fraction (1962 samplings) at a soil depth of 6 (11.1 pCi/mg) as compared with that at 4 and 9 (4.8 and 1.1 pCi/mg respectively) indicates th most of the innoculated Cs-137 entered the s through the roots rather than by transfer fr rainfall or litter fall. This conclusion is also su ported in that soil (< 0.250 mm) separated fr fine roots by ultrasonics contained nearly tw the Cs-137 concentration of that separated fr bark, small stones, etc. The 1969 soil sampling dicated that some downward accumulation of 137 occurred after 1962; for example, the conc tration at soil depth of 14 cm (0.67 pCi/mg) in 19 was higher than the 0.31 pCi/mg determined a

pth of 9 cm in 1962. Also, in the 1969 sampling ere was no evidence of a Cs-137 concentrating enomenon at the 6-cm depth as there was in the 62 sampling. Separates obtained through density adient zonal centrifugation indicated greater an 90% of the Cs-137 on soil is associated with e mineral soil components. Of the mineral com-nent, the bulk of the Cs-137 appears to be as-ciated with the predominant soil clay minerals, olinite and chlorite; however, there does seem be a certain amount of selective concentration Cs-137 in the micaceous minerals. (See also 74-05181) (Houser-ORNL)
74-05193

RSISTENCE OF RADIONUCLIDES IN SOIL, ANTS, AND SMALL MAMMALS IN AREAS ONTAMINATED WITH RADIOACTIVE FAL-OUT,
lifornia Univ., Los Angeles. Lab. of Nuclear dicine and Radiation Biology.
M. Romney, W. A. Rhoads, A. Wallace, and R. Wood.
CONF-710501-P1 - Proceedings of the Third tional Symposium on Radioecology, May 10-1971, Oak Ridge, Tenn. p 170-176, (1971), 1 fig, b, 32 ref.

scriptors: *Radioecology, Radioactivity, Ecolo- *Soil contamination, Small mals(Mammals), Fallout, Nuclear explosions, esium, *Strontium, Sorption, Testing, Move-nt, Abiotic environment, Biota, Biorhythms, od chains, *Radioisotopes, Root systems.

e persistence of radionuclides in soil, plants, small mammals was investigated periodically areas contaminated with fallout from veground nuclear detonations at the Nevada t Site. Study sites were established at various ations out to about 225 km from ground zero. phasis was placed upon the movement of Sr-90 Cs-137 from abiotic to biotic components. eral neutron activation products also were stu-d in fallout areas located within 5 km of nuclear avation tests. Radio-nuclides continued to be en up through plant roots in small amounts, as e progressed, and some continued to be osited on foliage as resuspended dust particles. inhalation route of entry became less impor-with passing time, whereas ingestion con-ed to be the most important route through ch radionuclides entered small mammals living ld fallout areas. Long-lived Sr-90 accumulated narily in bone tissue, while Cs-137 accumulated uscle and soft tissue. Most of the neutron ac-tion products are short-lived, but among those nd in animal tissues were isotopes of Co, Mn, W. Findings indicate that Sr-90 and Cs-137 will tinue to move in small amounts from abiotic to ic components in fallout-contaminated areas passing time. (See also W74-05181) (Houser-NL)
4-05194

CLING OF STABLE CESIUM IN A DESERT YSTEM,
fornia Univ., Los Angeles. Lab. of Nuclear licine and Radiation Biology.
Wallace, E. M. Romney, and R. A. Wood.
CONF-710501-P1 - Proceedings of the Third ional Symposium on Radioecology, May 10-1971, Oak Ridge, Tenn. p 183-186, (1971) 5 tab, ef.

criptors: *Cesium, *Cycling, *Ecosystem, serts, Ecology, Radioecology, Activation gy, Assay, Cycles, *Potassium, Soils, Plant ology, Mammals, Potassium radioisotopes, orption, Circulation, Movement, Dispersion, h of pollutants.

tents of stable Cs in several compartments of rt ecosystems represented at the Nevada Test have been determined by neutron activation. ssium in the same compartments has also been determined, and Cs:K discrimination under natural conditions has been evaluated. From compartment sizes some estimates have been made on the rates of Cs cycling through the systems. The rates were low, but the stable Cs was circulating. Compartments studied include soil, several different plant species, arthropods, reptiles, and mammals. The contents of Cs within compartments were in the nanogram per g of dry weight range. There appeared to be a progressive narrowing of the K/Cs ratio going from plants to reptiles and mammals. The addition of stable Cs as CsCl to a soil obtained from the Nevada Test Site resulted in leaf contents in Atriplex canescens of 0.0279, 0.580, 5.15, and 24.0 ppm per g of dry weight for application rates of 0,5, 20, and 50 ppm respectively. The applied Cs was slightly more available than was the original soil Cs. Stable Cs is freely circulated in ecosystems, although at levels lower than that of K by a factor of over 100,000. The stable Cs will have an influence in the cycling of Cs-137. (See also W74-05181) (Houser-ORNL)
W74-05195

ACCUMULATION OF CE-144 BY HICKORY AND CO-60 BY BLACK GUM SEEDLINGS,
Oak Ridge National Lab., Tenn.
W. A. Thomas.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 187-189, (1971) 2 tab, 7 ref.

Descriptors: Trees, *Hickory, *Radioisotopes, Absorption, Cycling nutrients, Foliar, Maple trees, Oak trees, Assay, Radioactivity, Soils, Plant-soil-water relationships, *Cobalt, Seeds, *Cesium.
Identifiers: *Blackgum seedlings, *Rare-earth elements, Seedlings.

Mockernut hickory (Carya tomentosa) trees accumulate the rare-earth elements, and black gums (Nyssa sylvatica) accumulate cobalt, resulting in foliar concentrations several orders of magnitude greater than those of other trees on the same site. To compare absorption rates, seedlings of these species and ones of red maple (Acer rubrum), tulip tree (Liriodendron tulipifera), and white oak (Quercus alba) were grown for 35 days in nutrient solution and in soil, both inoculated with Ce-144 and Co-60. The 'index of selective absorption,' defined here as the amount (dpm) of isotope transported to above-ground plant parts per 100 ml of nutrient solution absorbed by roots, compensates for differences among individuals in the volume absorbed. The Carya index for Ce-144 significantly exceeds ($P < 0.01$) the values for the other species both in soil (Carya 6720 plus or minus 1900; Acer 620 plus or minus 90; Liriodendron 320 plus or minus 50) and insolution (Carya 4590 plus or minus 450; Acer 770 plus or minus 430; Liriodendron 720 plus or minus 350; Nyssa 650 plus or minus 190; Quercus 170 plus or minus 40) in spite of large variation about the means. An insufficient number of Nyssa and Quercus seedlings survived in soil to permit valid statistical analyses. Nyssa and Carya indices for Co-60 in solution both significantly surpass ($P<0.50$) the indices for the other species but do not significantly differ from each other (Nyssa 5110 plus or minus 950; Carya 4470 plus or minus 890; Acer 990 plus or minus 500; Quercus 780 plus or minus 300; Liriodendron 410 plus or minus 130). Comparison of the index between treatments - soil versus solution - shows no significant difference for any species for either isotope. (See also W74-05181) (Houser-ORNL)
W74-05196

TRANSPIRATION MEASUREMENT IN PINES USING TRITIATED WATER AS A TRACER,
Argonne National Lab., Ill.
J. R. Kline, C. F. Jordan, and R. C. Rose.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 190-198, (1971) 4 fig, 16 ref, 2 tab.

Descriptors: *Transpiration, *Evapotranspiration, Measurement, *Moisture uptake, Transfer, *Red pine trees, Tritium, Water, Tracers, Water vapor, Air, Soils, Temperature, Thermal properties, Soil-water-plant relationships.
Identifiers: *Tritiated water.

Tritiated water was used to measure transpiration by red pines (Pinus resinosa) in the field throughout a growing season. The method used is based on previously published theoretical analyses of tracer dynamics in steady-state flowing systems. Transpiration began in the spring only when the soil was completely thawed, even though air temperatures had previously been above freezing for considerable periods of time. Spring transpiration averaged 0.3 cm/day for the forest stand. A maximum value of 0.8 cm/day was found in mid-June at a time when available soil moisture was not rate limiting. In August as soil moisture became depleted, average transpiration rate fell to 0.4 cm/day. Total seasonal consumption of water by the forest from April 1 to October 31, 1970, was 91.4 cm. Rainfall input during the same period was 82.5 cm, indicating only a minor moisture deficit for this growing season. Actually, measured seasonal values agreed well with estimates obtained by solution of Penman's equation and from the evaporation equivalent of net radiation. (See also W74-05181) (Houser-ORNL)
W74-05197

TRITIUM MOVEMENT IN AN OLD-FIELD ECOSYSTEM DETERMINED EXPERIMENTALLY,
Argonne National Lab., Ill.
C. F. Jordan, J. R. Kline, and D. S. Sasscer.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 199-203, (1971) 7 fig, 7 ref.

Descriptors: *Tritium, Movement, *Ecosystems, *Ecological distribution, Vertical migration, *Path of pollutants, Absorption, Roots, Water pollution, Soil contamination, Vegetation, Rain water, Diffusion, Model studies, Hydrologic models, Computer models, Adsorption, Clays, Evapotranspiration.

Tritium movement through an old-field ecosystem was studied in order to better understand how water behaves while inside various ecosystem compartments, and also to validate a mathematical model of tritium movement in ecosystems. Tritiated water was applied to field plots, and was collected at various depths in the soil and from the vegetation at approximately weekly intervals. The experimental results confirmed the following computer predictions: A pulse of tritium will move downward through the soil as a function of the amount of rainwater entering the soil above the pulse. Simultaneous with downward movement, the peak will broaden and flatten due to diffusion. The pulse will become immobilized if the upper soil dries out to the extent that rainwater does not penetrate to the depth of the pulse peak. Concentrations of tritium in vegetation will be equal to concentrations in the soil water at the depth at which the plant is taking up water. Loss of tritium from the system will occur by evapotranspiration and deep drainage. The computer predictions departed from the experimental results because of two phenomena not included in the model: (1) direct transfer of tritium to lower levels of soil via root and worm holes; (2) absorption of tritiated hydroxyl groups onto clay particles. (See also W74-05181) (Houser-ORNL)
W74-05198

INFLUENCE OF WATER REGIME ON THE INDIRECT ABSORPTION OF RADIOCESIUM, RADIOSTRONTIUM, AND RADIOCOBALT BY LOWLAND RICE,
European Atomic Energy Community, Ispra (Italy). Biology Div.
C. Myttenaere, and U. Marckwordt.

In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 212-217, (1971) 1 fig, 6 tab, 17 ref.

Descriptors: *Soil contamination, *Rice, *Cereal crops, *Cesium, *Cobalt, *Strontium, Absorption, Roots, Lysimeters, Data collections, Irrigation, Water pollution, Flood irrigation, Behavior, Ecology, Cation exchange, Oxidation-reduction potential.

Rice soils retain a high percentage of radionuclides transported by irrigation water. The accumulated radioactivity can partly be released to the roots of lowland rice. In order to establish the influence of water regime on the indirect radiocontamination of rice, the availability in soils and the absorption of plants of Cs-134, Sr-85, and Co-60 were studied during three successive years (1967, 1968, 1969), using the same variety in flooded and nonflooded conditions. The experimental conditions of the rice culture in lysimeters were checked with data collected in an irrigated rice field. Radiostrontium and radiocesium absorption by plants was not greatly influenced by the different water regimes. Radiocobalt level of plants was considerably higher in flooded rice and thus reflected the increased availability of Co in flooded soils. Concentration factors varied with the radionuclide and the plant organ. The variations in specific activity of radioisotopes in the plant underline a different behavior of the radioactive and stable isotope in the soil. Under these experimental conditions, only cations, the solubility of which depends directly on the redox state of the soil, were more available and were taken up by the rice plants. (See also W74-05181) (Houser-ORNL)
W74-05199

CALCIUM CYCLING: DIFFUSION INTO A FOREST SOIL,
Oak Ridge National Lab., Tenn.
D. F. Grigal.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 218-224, (1971) 3 fig, 2 tab, 16 ref.

Descriptors: *Calcium, Cycles, *Cycling nutrients, *Forest soils, Hickory trees, Oak trees, Maple trees, Ecosystems, Soil contamination, Water pollution, *Radioactivity, Movement, Soil water, Soil water movement, Diffusion, Vertical migration, Vegetation, Absorption, Transfer, Lysimeters, Cation exchange.

Calcium-45 was introduced into red maple (Acer rubrum L.) trees in spring, and the leaves were harvested in autumn and laid on the floor of an oak-hickory forest. Movement of Ca-45 from the leaves into other components of the ecosystem, and particularly into the soil and soil-water systems, was monitored for two winters and the intervening summer by periodic sampling of soil, litter, and soil-water. After 72 weeks, approximately 50% of the Ca-45 had moved into the soil. Activity of the isotope decreased exponentially with depth and little had moved below 20 cm. Some of the isotope had also cycled through the surrounding vegetation and back to the soil surface. The Ca-45 did not move into the soil in solution but instead moved by surface or exchange diffusion along the soil particles. A grain-boundary diffusion model, which infers rapid diffusion along pores and slow diffusion into soil peds, was used to predict this movement. The Ca-45 initially introduced into the system is accounted for by that observed in the litter and that predicted by the model in the soil. The results imply that studies which emphasize soil solution, as with tension lysimeters, may not provide sufficient information with which to describe movement of naturally incorporated cations from leaf litter into soil. The results further indicate that after introduced fertilizer cations are initially fixed either chemically by the soil or biologically by the macro- and microflora, losses of such cations from the system are likely to be small. (See also W74-05181) (Houser-ORNL)
W74-05200

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5C.
W74-05201

CYCLING OF ZINC-65 IN A SIMPLE FOOD WEB,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5C.
W74-05202

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-05204

RELATIONSHIPS BETWEEN PHOSPHORUS-32 ACCUMULATION IN ALGAE, BACTERIA, AND TUBIFICIDS,
Western Michigan Univ., Kalamazoo. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-05206

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 5C.
W74-05208

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W74-05210

EFFECT OF ORGANIC INSECTICIDES UPON CARBON-14 UPTAKE BY FRESHWATER PHYTOPLANKTON,
Florida Technological Univ., Orlando. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W74-05211

SOME ECOLOGICAL CONSIDERATIONS IN LOCATING A NUCLEAR-POWERED ELECTRICAL GENERATING FACILITY ON TH NORTH ANNA RIVER, VIRGINIA,
Virginia Commonwealth Univ., Richmond.
For primary bibliographic entry see Field 5C.
W74-05212

NUTRIENTS FROM TILE DRAINAG SYSTEMS, BIO-ENGINEERING ASPECTS O AGRICULTURAL DRAINAGE, SAN JOAQU VALLEY, CALIFORNIA.
California State Dept. of Water Resourc Fresno. San Joaquin District.
Copy available from GPO Sup Doc EP1.16:13030 ELY5/71-3, $1.00; microfiche fr NTIS as PB 216 552 $1.45. Water Pollution Cont Research Series, May 1971. 90 p, 18 tab, 29 tab, ref. EPA Project 13030 ELY 05/71-3.

Descriptors: *Farm wastes, Path of pollutan Water pollution sources, *Tile draina Nutrients, *Nitrates, *Phosphates, Denitrifi tion, Fertilization, Irrigation practic *California.
Identifiers: *San Joaquin Valley(Cal *Composited drainage, *Nutrient variability, digenous nutrients, Residual nitrogen.

Tile drainage systems of the San Joaquin Va were monitored for nutrients (nitrogen phosphorus) to determine the algal growth po tial (AGP) of the waste, and the degree of tr ment required for removal of AGP. The object were to determine: (1) the average nutrient c centrations in tile drainage, (2) the magnitude annual, areal and seasonal variability of nutri and discharges, (3) if a possible correlation ex between nutrients and agricultural practices, (4) if existing soil conditions influence nutr concentrations and flows. Average discharges nutrient concentrations were calculated for ferent years, months and areas of inte (valleywide, major tiled areas, physiographic p tions and soils). Average nutrient concentrat in the composited drainage from the Valley found to be 19.3 mg/l for nitrogen (NO3-N) 0.09 mg/l for phosphorus (PO4-P); ave discharge was 1.4 ac-ft/ac/yr. Nutrient levels i composited drainage did not change appreci with time. Variability of nutrients was obse for different seasons; a twofold decreas nutrients was attributed to dilution by irriga and denitrification. N was three times more centrated in drainage from one out of four m tiled areas investigated. The high N levels wer tributed more to indigenous concentrations in tain alluvial fan soils and their parent mate than fertilization. Low N levels found in drai from basin soils were believed caused by deni cation. P was seven times higher in the drai from the southernmost area than the other investigated. These extraordinarily high l (0.69 mg/l) were attributed to indigenous co trations in certain soils made available by an bic soil conditions. High discharge in the nort most area (2.3 ac-ft/ac) was believed to be ca by rapid laternal hydraulic conductivity and rounding irrigation influence. (EPA)
W74-05229

SUBSURFACE BIOLOGICAL ACTIVITY RELATION TO GROUND WATER PO TION,
Robert S. Kerr Environmental Research Ada, Okla.
W. J. Dunlap, and J. F. McNabb.
Copy available from GPO Sup Do EP1.23:660/2-73-014, $0.90; microfiche from as PB-227 990 $1.45. Environmental Prote Agency Technology Series Report EPA-660 014, September 1973. 60 p, 6 tab, 103 ref. EPA ject 21 AKQ-10.

Descriptors: *Groundwater, *Subsurfac vestigations, *Microbiology, *Subsurface w Habitats, Water pollution, Water pollution ef Path of pollutants, Zone of aeration, Zone o

tion, Biological communities, Biodegradation, mperature, Hydrostatic pressure, Anaerobic cteria.
entifiers: *Subsurface microbiology, ubsurface environment, Microbial activity.

ological activity occurring in subsurface regions low the soil zone may be of considerable im- rtance in determining the fate and effect of pol- ants in ground water, but this possibility has ceived little previous attention. A discussion is esented of subsurface biological activity in re- d to ground-water pollution as reflected by ailable literature references. The subsurface en- onment is discussed in terms of factors likely to of greatest significance in regard to the velopment of biological systems, and previous estigations of subsurface microbial activity are iewed. Available information indicates the sence in the upper continental crust of the earth numerous regions, particularly those of sedi- ntary origin, which are probably suitable bitats for many microbial species. Previous in- tigations of subsurface microbial activity arly show the presence of diverse microbial pulations in many subsurface regions below the l zone. Hence, microbial activity appears both ssible and probable in most subsurface regions importance in regard to ground water. Further cidation of the extent and nature of microbial ivity in subsurface regions is needed in veloping methods for predicting the impact of lutants on ground-water quality. (EPA)
4-05230

NTENT AND COMPOSITION OF ORGANIC ATTER IN SOD PODZOLIC AND SOD SANDY ILS OF DIFFERENT DEGREES OF TTING, (IN RUSSIAN),
r primary bibliographic entry see Field 2G.
4-05237

GIONAL ENVIRONMENTAL POLLUTION UDY: INVENTORY AND ANALYSIS.
sa City-County Health Dept., Okla.
ian Nations Council of Governments, Tulsa, ahoma, June 1972. 59 p, 1 fig, 11 tab, 5 ref. A OK 0656 1012.

scriptors: *Data storage and retrieval, vironmental control, *Computer programs, llution abatement, *Urban sociology, Data cessing, Planning, Pollutants, Information ieval, Air environment, Water pollution con- , Soil environment, Solid wastes, Waste er(Pollution), Data collections, Urbanization.
ntifiers: *Environmental impact, lsa(Oklahoma), Impact assessment.

Indian Nations Council of Governments is eloping a computerized file containing all per- nt information with respect to environmental tection by providing inventories of all emis- s to the ambient atmosphere, all effluents to Region's streams, all industrial wastewater rces, all potable water sources and treatment ts, and all solid waste collection systems and osal sites. Summaries are presented of the in- tories along with a preliminary analysis of the . Included is the second phase of the Environ- tal Data File (Coding Manual) consisting of puter forms, coded structures, instructions for ng, and an example computer retrieval. Some he data items included in the seven sub-files industrial air contaminant emissions, industri- wastewater sources and effluents; industrial l waste quantities; major sewage treatment ity capacities, discharge volumes and pollu- al loads; water treatment plant capacities; l waste landfill capacities; and proposed elopment data items. The data are structured ease of integration into existing files, as well as of updating. The file will provide information pollution problems necessary for making as- ments of their environmental impact on vari- systems. The data can be used for systems models which are being developed for various public improvements. This is a continuing study designed to provide the framework for a complete data system on environmental pollution. The data system will be used for environmental impact assessment, water and sewerage planning, solid waste management, and many other planning functions. (Poertner)
W74-05239

ORGANOMERCURIALS IN THE ENVIRONMENT,
Glasgow Univ. (Scotland). Dept. of Chemistry.
R. J. Cross.
Chemistry and Industry, No 15, p 719-721, Aug 4, 1973. 1 fig, 2 tab, 11 ref.

Descriptors: *Mercury, Pollutants, *Water pollution sources, *Toxicity, Water pollution control, Chemcontrol, Biocontrol, Adsorption, Bacteria, Sediments, Environmental control, Environmental effects, Industrial wastes, Pollution abatement, Aquatic microorganisms, Aquatic bacteria, Bacteria, Benthic flora, Water chemistry, Enzymes, Chemical reactions, Economic feasibility, Dredging, Clams, Aquatic animals, Benthic fauna.
Identifiers: *Mercury compounds, Methyl mercury, Dimethyl mercury, Lewis acids.

The oceans contain about 100 million tons of Hg, many times the total volume mined, used, and dispersed by man, without threatening global poisoning. The isolated cases of pollution-caused Hg poisoning on record, as in chemical laboratories, are caused by locally high concentrations. The main ecological problem is due to Hg in surface waters. Its most dangerous source is the effluent from Cl-alkali factories. Oxidation converts Hg metal into Hg(II) ion which is rapidly adsorbed on bottom sediments, but gradually converted to methyl- and/or dimethyl mercury compounds, mainly by the methylcobalamine coenzyme contained in benthic microorganisms. Of several proposed methods for removal of Hg or the coenzyme from waterways (such as dredging, application of Lewis acids, biological conversion by Pseudomonas bacteria, and cultivation of clams in polluted waters), none seems as practicable or economical as the preventive approach of avoiding the entrance of Hg into waters in the first place. (Brown-IPC)
W74-05248

SLOW RELEASING NITROGEN FERTILIZER FROM THE WASTE PRODUCT, LIGNIN SULPHONATES,
Forschungsanstalt fuer Landwirtschaft, Brunswick (West Germany). Institut fuer Biochemie des Bodens.
W. Flaig.
Chemistry and Industry, No 12, p 553-554, June 16, 1973. 2 fig, 3 ref.

Descriptors: *Fertilizers, *Lignins, *Sulfite liquors, *Pulp wastes, *Nitrogen compounds, Ultimate disposal, Solid wastes, Liquid wastes, *Byproducts, Ammonium compounds, Nitrates, Organic compounds, Solubility, Industrial wastes, Waste disposal, Pulp and paper industry, Soil amendments.
Identifiers: Spent sulfite liquors, 'N-Lignin'.

A soluble fertilizer called N-Lignin was prepared by concentrating spent sulfite pulping liquor to 20% solids content and then heating it at 125 C and 12 atm pressure for 1-2 hr with oxygen and ammonia, followed by evaporation and spray drying. The product contained ca. 5% ammonia-nitrogen, 1% amide-nitrogen, and 6% other organic nitrogen. The N-Lignin was not readily leached from soil, because ca. 45% of the N was bound to high-molecular-weight substances. Good results were obtained in potted plant tests with N-Lignin alone or in 1:1 mixtures with ammonium nitrate. (Buchanan-IPC)
W74-05249

A STARCH-FREE EFFLUENT PROGRAM FOR CORRUGATING PLANTS,
Canada Starch Co. Ltd., Montreal (Quebec).
J. M. L. Currie.
CPPA (Canadian Pulp and Paper Association) Technical Section Proceedings, 1972. p D22-D24.

Descriptors: *Carbohydrates, *Industrial wastes, *Pollution abatement, Water pollution sources, *Pulp wastes, *Adhesives, Equipment, Operation and maintenance, Waste water(Pollution), *Canada, Effluents, Biochemical oxygen demand, Discharge(Water).
Identifiers: Starch, Gluing, Converting industry, Corrugated boards, Corrugated containers, Materials handling, Wash waters.

Starch can reach the sewers of a corrugated board or box factory as a result of faulty equipment, improper operation, and carelessness. The points at which starch is being lost in an adhesive gluing system have been studied at Canada Starch Co. Ltd. and included dry spills, system leaks, overflows, cleanups, and the use of nonstandard-quality batches of corrugating adhesives. Corrective measures by way of equipment modifications and improved handling and operating techniques are discussed. Specific remedies must be adapted to the specific conditions of each factory. No general panacea is possible. (Brown-IPC)
W74-05250

METHANOL DISTRIBUTION IN AN EVAPORATION PLANT,
Billeruds A.B., Saffle (Sweden).
For primary bibliographic entry see Field 5D.
W74-05253

WATER AND WASTE WATER PROBLEMS IN MODERN TEXTILE FINISHING PLANTS (WASSER- UND ABWASSERPROBLEME IM MODERNEN TEXTILVEREDLUNGSBETRIEB),
For primary bibliographic entry see Field 5D.
W74-05255

CHARACTERIZATION OF SULFITE PULPING EFFLUENTS AND AVAILABLE ALTERNATIVE TREATMENT METHODS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-05278

FOREST PRODUCTS POLLUTION CONTROL -- ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
M. E. Johnson.
Available from the National Technical Information Service as PB-222 173, $3.00 in paper copy, $1.45 in microfiche. Supplementary Report No 1 to VP-X-100, June 1973. 10 p. 1 tab, 67 ref.

Descriptors: *Lumbering, *Wood wastes, *Industrial wastes, *Environmental control, *Water pollution sources, *Air pollution, *Bibliographies, Forest management, Forest fires, Waste water treatment, Treatment facilities, Canada, Waste disposal, Solid wastes, Equipment, Environmental effects, Pollution abatement, Waste water treatment, Saw mills.
Identifiers: Noise, Scenic pollution, Plywood industry, Wood industry, Forest products industry, Wood preservatives, Logging machines.

This supplement to an earlier annotated bibliography provides references (with abstracts) to the literature acquisitioned at the library of the Western Forest Products Laboratory between July 1972 and June 1973, dealing with water, air, noise, and/or scenic pollution of the environment caused by logging, log handling, and the manufacture of lumber, plywood, and other forest products other

than pulp and paper. (See also W73-03746) (Brown-IPC)
W74-05284

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
T. Flaim.
Available from the National Technical Information Service as PB-224 063, $3.00 in paper copy, $1.45 in microfiche. Paper prepared for the Assembly Scientific Staff of the New York Legislature. Nov. 17, 1972. 26 p. 3 tab, 28 ref.

Descriptors: *Pollution abatement, *New York, Agriculture, *Industrial wastes, Food processing industry, *Farm wastes, Dairy industry, *Pesticides, Air pollution, Water pollution sources, Sedimentation, Nutrients, Legislation, *Law enforcement, Research priorities.

A survey of the location, magnitude, and control of agricultural pollution problems in New York State led to the following findings: (1) Agriculture generates over 50% of the total waste volume produced annually in the USA, yet its contribution to pollution is relatively minor. (2) In decreasing order of importance, agricultural pollution sources in New York State come from food processing, animal (farm) wastes, dairy feedlots, sedimentation, plant nutrients, pesticides, and agricultural air pollution. (3) Compared to other industries, agricultural activity is diverse; hence agricultural pollution is difficult to measure, and any legislative control difficult to enforce. (4) Existing technology is adequate for controlling agricultural pollution, except food-processing wastes. Needs for further research are pointed out, and implications of this study for policy-making legislators are indicated. (Brown-IPC)
W74-05285

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS -- DEVELOPMENT OF NUCLEAR TECHNIQUES,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 5A.
W74-05287

PYROGRAPHIC ANALYSIS OF WASTE WATERS,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 5A.
W74-05294

ATRAZINE, PROPACHLOR, AND DIAZINON RESIDUES ON SMALL AGRICULTURAL WATERSHEDS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
W. F. Ritter, H. P. Johnson, W. G. Lovely, and M. Molnau.
Environmental Science and Technology, Vol 8, No 1, p 38-42, January 1974. 8 tab, 11 ref.

Descriptors: *Pesticide residues, *Agricultural watersheds, *Pesticide kinetics, *Triazine pesticides, *Phosphothioate pesticides, *Chlorinated hydrocarbon pesticides, Small watersheds, Degradation(Decomposition), Surface runoff, Movement, Water pollution sources, Persistence, Soil analysis, Bottom sediments, Watersheds(Basins), Water analysis, Diazinon, Loess, Soil profiles, Insecticides, Herbicides.
Identifiers: Fate of pollutants, Pesticide loss, Chemical concentration, Atrazine, Propachlor, Electron capture gas chromatography, Sample preparation.

Atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine), propachlor (2-chloro-N-isopropylacetanilide), and diazinon (0,0-diethyl 0-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate) losses in sediment and surface runoff were measured from four watersheds ranging in size from 1.9-3.8 acres and located in the loessial soil region of western Iowa. Two of the watersheds were planted to ridged corn, and two were planted to surface-contoured corn. Movement of atrazine, propachlor, and diazinon in the soil profile and degradation of these pesticides were measured. Water and sediment samples were obtained from the four watersheds with single-stage sediment samplers. All water and sediment samples were collected in glass bottles, transferred to polyethylene bottles, and frozen immediately after collection. Soil samples were taken within 24 h after pesticide application and at 7-day intervals for the first few weeks. The Geigy Chemical Corp. (1965) ultraviolet method was used for atrazine analysis. Propachlor and diazinon were determined by electron capture gas chromatography. Pesticide losses were much greater from the surface-contoured watersheds than the ridged watershed. Significant amounts of surface-applied atrazine and propachlor were removed from the surface-contoured watersheds by storms occurring shortly after the pesticides were applied. Insignificant amounts of diazinon were removed in the surface runoff and sediment. Generally, pesticide concentrations were higher in the sediment than in the runoff water; however, greater total losses were associated with the greater volume of water. (Holoman-Battelle)
W74-05295

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
R. P. Canale.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2358-2371, November 1973. 16 fig, 8 ref.

Descriptors: *Coliforms, *Mathematical models, *Michigan, *Distribution patterns, Water temperature, Industrial wastes, Sewage, Flow, Water quality, Bays, Water pollution effects, Waste disposal, Equations, Dispersion, Seasonal, Mortality, Boats.
Identifiers: *Grand Traverse Bay(Mich), Boardman River, Survival.

A predictive model for total coliform bacteria in Grand Traverse Bay, Michigan, has been developed using continuity equations with a simple fluid transport model and temperature-dependent first order kinetics. The model has been verified over a wide range of loadings during a period of several years with data obtained during numerous field surveys. The model has been applied to a number of water quality control problems of interest to local planners and others, such as defining the role of storm sewer discharges to the bay, the effects of additional areas for development, and the discharge of wastes from private watercraft. (Mortland-Battelle)
W74-05328

ENERGY AND THE ENVIRONMENT--ELECTRIC POWER.
Council on Environmental Quality, Washington, D.C.
Available from NTIS, Springfield, Va. 22151 - PB-223 326 - Price $3.00 printed copy; $1.45 microfiche. Report, August 1973. 58 p, 13 fig, 18 tab, 1 append.

Descriptors: *Water pollution sources, *Electric powerplants, *Air pollution, *Environment, *Thermal powerplants, Costs, Electric power production.

The use of energy damages the environment not only when it is used but also when it is extracted, processed, transported, and distributed to the consumer. The production and use of energy pollute air, befoul streams, and damage land. And as t use of energy has multiplied, so have the attenda environmental impacts. The conflict betwe energy needs and the environment poses problem that must be solved by understanding t factors that influence demands for energy and developing energy systems that meet these d mands with minimal damage to the environme The elements underlying the growing demand f energy and the environmental implications of t complex energy systems for meeting this dema are examined. Focus is on electric energy becau of the particularly rapid growth in this sector. I proved efficiency of energy systems and ener conservation will reduce environmental damag and slow use of energy resources. Electric ener demand forecasts can be combined with data the environmental impacts of each electric ener system to yield an estimate of projected envir mental consequences. (Knapp-USGS)
W74-05330

RESEARCH TO DETERMINE THE ENVIRO MENTAL RESPONSE TO THE DEPOSITION SPOIL ON SALT MARSHES USING DIK AND UNDIKED TECHNIQUES--FIRST ANNU PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga
For primary bibliographic entry see Field 5C.
W74-05332

RELIABILITY AND ECONOMIC OPTIMI TION FOR URBAN RETURN FLO MANAGEMENT,
Texas Univ., San Antonio. Div. of Environme Studies.
C. S. Shih, J. K. Garner, and G. L. Curry.
Water Resources Bulletin, Vol 10, No 1, p 1 118, February 1974. 8 fig, 5 tab.

Descriptors: *Optimization, *Water pollution c trol, *Urban runoff, Systems analy Economics, Probability, *Texas, Water mana ment(Applied).
Identifiers: *San Antonio(Tex.).

Reduction of pollution to urban water resou by runoff was studied as a water-quality man ment problem. An optimization model developed for determination of the best pollu control policies for each treatment facility in te of the minimization of total regional cost req ments, the quality control requirements, and reliability desired. A change-constrained quadr programming technique coupled with parame analysis is utilized as the basic solution appro A practical problem based on the situation exis in the San Antonio River basin region of T was used for the illustration of this applica (Knapp-USGS)
W74-05333

NUMERICAL AND ANALYTICAL SOLUTI OF DISPERSION IN A FINITE, ADSORB POROUS MEDIUM,
California Univ., Davis. Dept. of Water Sci and Engineering.
M. A. Marino.
Water Resources Bulletin, Vol 10, No 1, p 8 February 1974. 1 fig, 6 ref.

Descriptors: *Dispersion, *Path of pollut *Porous media, *Numerical analysis, Mathe cal models, Groundwater movement, Adsorpt

Numerical and analytical solutions are devel for the distribution of a contaminant within a sorbing porous medium in a unidirectional field subject to a step function for input conce tion. The medium is considered to be homo ous, isotropic, and areally finite. As a bypro solutions are also obtained for the case of a no sorbing porous medium. An example that de strates the applicability of the solution presented. (Knapp-USGS)
W74-05334

EFFECT OF TWO IMPOUNDMENTS ON THE SALINITY AND QUANTITY OF STORED WATERS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
H. B. Pionke, and O. D. Workman.
Water Resources Bulletin, Vol 10, No 1, p 66-80, February 1974. 6 fig, 2 tab, 7 ref.

Descriptors: *Salinity, *Evaporation, *Reservoirs, *Oklahoma, Water quality, Water pollution sources, Seepage, Saline water, Flood control, Water chemistry, Impoundments.

The effect of hydrologic and chemical processes on salinization of stored waters was determined for two small floodwater-retarding structures located in western Oklahoma. One structure, designed to accommodate a large influx of sediment, was overdesigned (operated at reduced capacity) by upstream diversion of approximately one-half the inflow. Over a 2-year period, the total salinity of stored waters increased approximately 22 times, and the stored water volume decreased to 1/33 its initial volume in the overdesigned (underused) structure, while both volume and salinity of stored waters remained comparatively stable in the other structure. The lack of sufficient dilution by better quality surface runoff and the increased residence time of water in the impoundment apparently caused most of the salinity increase. The bulk of the salt load entering the overdesigned structure, to be concentrated later by evaporation, was associated with base rather than storm inflow. After base inflow ceased, substantial losses of salt load and stored water occurred concurrently. The loss was not adequately explained by chemical precipitation in association with evaporation. Seepage and evaporation appeared to account for much of the hydrologically unexplained loss of stored waters. (Knapp-USGS)
W74-05335

RETENTION BASIN FAILURES IN CARBONATE TERRANES,
Geological Survey of Albama, University. Limestone Hydrology Section.
W. M. Warren.
Water Resources Bulletin, Vol 10, No 1, p 22-31, February 1974. 4 fig, 12 ref.

Descriptors: *Subsidence, *Lagoons, *Water pollution sources, *Sinks, Karst hydrology, Limestones, *Carbonate rocks, Land subsidence, Subsurface drainage, Path of pollutants,
Identifiers: Subsurface erosion, Retention basins.

Sinkholes and subsidence occur in areas subject to dewatering of carbonate formations. Excessive groundwater pumpage is a causative factor in areas of increased sinkhole activity. Subsurface erosion of unconsolidated materials underlain by carbonate rocks is one cause of the collapses. Infiltrating water from retention basins may cause subsurface erosion and eventual failure by collapse of the structure. The resulting groundwater contamination would be great as the pollutants spread throughout the solution-cavity system. (Knapp-USGS)
W74-05337

THE NONPARASITIC DISEASES. IMMISSION DAMAGE (GAS, SMOKE AND DUST DAMAGE). WASTE WATER DAMAGE INCLUDING DAMAGE CAUSED BY SOLID WASTES,.
For primary bibliographic entry see Field 5C.
W74-05342

EFFECT OF GREEN FERTILIZER ON GRAPE YIELD,
Yu. Magriso, B. Danailov, G. Peshakov, and A. Georgiev.
Agrokhimiya. 4, p 56-60. 1972. Illus.
Identifiers: *Fertilizers, *Grapes, Manure, Microorganisms, *Nitrogen, Nutrition, Pea, Rye, Crop yield.

Experiments performed on black-soil, plowed-under with a pea-rye-green manure mixture, increased the amount of assimilated N and the number of beneficial microorganisms. These factors, with an optimal water regime, increased the harvest of grapes without loss of quality.--Copyright 1973, Biological Abstracts, Inc.
W74-05346

DRUG RESISTANCE OF COLIFORM BACTERIA IN HOSPITAL AND CITY SEWAGE,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow, and O. W. Prozesky.
Antimicrob Agents Chemother, Vol 3, No 2, p 175-180, 1973.
Identifiers: Ampicillin, Bacteria, Chloramphenicol, *Coliform bacteria, *Drug resistance, *Environmental, Escherichia-coli, Infect-drugs, Pollution, *Salmonella-typhi, *Sewage, Streptomycin, Sulfonamide, Tetracycline.

The number and properties of drug-resistant coliform bacteria in hospital and city sewage were compared. There was little difference in the counts of organisms with nontransferable resistance to 1 or more of 13 commonly used drugs. An average of 26% of coliforms in hospital waste water had transferable resistance to at least one of the drugs ampicillin, chloramphenicol, streptomycin, sulfonamide or tetracycline as compared to an average of 4% in city sewage. R+ bacteria in the hospital discharge were also resistant to a broader spectrum of drugs than those in city sewage. In both effluents, the occurrence of fecal Escherichia coli among R+ coliforms was twice as high as among coliforms with nontransferable resistance. Resistance was transferable to Salmonella typhi, and such drug-resistance pathogens in the water environment could be of particular concern. The significance of the results with regard to environmental pollution with R+ bacteria and the dissemination of these organisms is discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-05361

DIRECT COUNTS AND PLATE COUNTS OF BACTERIA IN THE DANUBE BETWEEN BERG SPRING AND ULM (IN GERMAN),
Staatl Institut fuer Seenforschung und Seenbewirtschaftung, Langenargen (West Germany).
For primary bibliographic entry see Field 5A.
W74-05362

PHYSIOECOLOGY OF THE UMSINDUSI RIVER WITHIN THE PIETERMARITZBURG CITY LIMITS,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Botany.
L. J. Nash, C. H. Bornman, and J. Heeg.
Trans R Soc S Afr, Vol 40, No 3, p 197-208, 1972, Illus.
Identifiers: *Bacteriology, Ecology, *Physioecology, Pollution, Rivers, *South Africa(Umsindusi River), Cities, *Domestic wastes.

A physioecological study of the Umsindusi River at Pietermaritzburg (South Africa) was carried out to estimate the changes in composition taking place during its passage through the city. While little evidence of gross industrial pollution was found, there was a marked enrichment of many constituents, particularly organic substances. A number of sources contribute to the pollution of the Umsindusi, and while this pollution is at present within the self-purification capacity of the river, recovery is slow, and the chemical and bacteriological quality of the water leaving Pietermaritzburg is poor.--Copyright 1973, Biological Abstracts, Inc.
W74-05363

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1973. 448 p, 39 fig, 12 tab, 200 equ, 228 ref. R. A. Deininger, Ed. Price: $24.50.

Descriptors: *Systems analysis, *Mathematical models, *Environmental control, *Water pollution control, *Water supply, *Pollution abatement, Solid wastes, Disposal, Air pollution, Optimization, Simulation analysis, Stochastic processes, Digital computers.

The use of mathematical models and systems analysis techniques is considered for the control of environmental pollution and resources development. These methods allow decision makers to screen the various control technologies and procedures and to select those which are most efficient. The book, written by an international group of experts, is organized in six major parts: (1) water pollution control; (2) water supply and water resources development; (3) air pollution control; (4) solid waste disposal; (5) noise control; and (6) total environmental models. Each of these sections contains one or more individual papers. Overall, the book summarizes the present state-of-the-art in mathematical modeling for environmental pollution control. Included are a description of a river basin model and numerous alternate strategies available for improving the river's water quality, a paper dealing with regional sewerage systems, a discussion of ecological aspects of water quality models, the design of water supply systems, a consideration of the economic consequences of constructing weirs and canals, results of air quality modeling studies of cities in Germany, experiences with vehicle routing models in the United Kingdom, the introduction of mathematical modeling and formal optimization techniques to noise pollution, an overall environmental quality model, and an analogy between the safeguard of nuclear materials and environmental pollution control. (Bell-Cornell)
W74-05386

SYSTEMS ANALYSIS FOR ENVIRONMENTAL POLLUTION CONTROL,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5G.
W74-05387

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.
W74-05388

REGIONAL WASTEWATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5D.
W74-05389

A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,
Purdue Univ., Lafayette, Ind., Dept. of Economics.
D. E. Pingry, and A. B. Whinston.
In: Models for Environmental Pollution Control, (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 61-90 (Chapter 3), 1973. 2 fig, 4 tab, 1 map, 71 equ, 20 ref, 3 append.

Descriptors: *Water quality control, *Water temperature, *Dissolved oxygen, *Indiana, *Water

pollution treatment, *Costs, *Simulation analysis, Information retrieval, Optimization, Resource allocation, Comprehensive planning, River basins, Regional analysis, Effluents, Economic efficiency, Alternative water use, Biochemical oxygen demand, Thermal pollution, Waste water(Pollution), Cooling towers, Flow augmentation, Constraints, Computer programs.
Identifiers: *West Fork White River(Ind.), *External effects, Regional planning, Opportunity costs, By-pass piping, Treatment plants, Non-linear programming.

The information problem when dealing with external effects of water pollution is immense. Usually the external effect (cost or benefit) is transferred to the affected party through a complex series of physical, chemical or biological processes; an initial effluent discharged by a polluter may affect a downstream user, and in such a case the opportunity costs of a specific resource allocation are not at all clear. This has led to attempts to produce the effects of resource allocation under external effects by modeling the appropriate physical system. Moreover, since different policies are appropriate for different polluters--uniform rules cause significant inefficiencies--a regional approach (thus various treatment strategies) is being considered. Presented is a simulation model of river basin water quality that serves as the constraint set for an optimization model which searches for the efficient solutions given the quality goals. The model explicitly considers water temperature and its relationship to dissolved oxygen; it considers simultaneously several treatment strategies and their costs. The model answers: What is the least cost combination of treatment facilities that will meet given temperature and dissolved oxygen goals. Using such a model, a river basin authority could present an assortment of river use and cost combinations for consideration by the affected parties. (Bell-Cornell)
W74-05390

INTRODUCTION TO SIMULATION TECHNIQUES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W74-05391

MATHEMATICAL MODEL FOR OXYGEN BALANCE IN RIVERS,
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
G. Chevereau.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 107-136 (Chapter 5), 1973. 14 fig, 28 equ, 11 ref.

Descriptors: *Simulation analysis, *Water quality control, *Oxygen, Rivers, Biodegradation, Diffusion, *Computer programs, Advection, Unsteady flow, Downstream, Reach(Streams), Organic matter, Systems analysis, Mathematical models.
Identifiers: *France(River Vienne), *Streeter-Phelps equation, Finite differences, Paper mills.

A mathematical model is described, based on the Streeter-Phelps equation which has been extended to allow for diffusion. A computer program has been established which simulates unsteady flow in rivers. The parameters of the unsteady flow are introduced into the pollution model in which the Streeter-Phelps equation is approximated in a finite difference form and integrated by the so-called 'two steps explicit method.' Discussed is the testing of the model on the French river Vienne in a reach downstream of a large paper mill, in connection with a specialist team of chemists and biologists. Observance showed a significant discrepancy between the rates of biodegradation of organic matter measured in laboratory tests and those obtained by adjustment of the model. Auxiliary phenomena make the problem more complex so that rational determination of the rate of biodegradation of organic matter is hazardous. Thus, presently, it seems best to evaluate 'bulk rates' of biodegradation by adjustment of a model on observed situations in the river. This method necessitates numerous field measurements and requires great care in extrapolating the results of the model. (Bell-Cornell)
W74-05392

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
M. E. Bender.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 137-153 (Chapter 6), 1973. 7 fig, 34 ref.

Descriptors: *Water pollution control, *Aquatic environment, *Mathematical models, *Eutrophication, *Biota, *Water quality, Ecosystems, Systems analysis.

Most biological models are too restricted in scope to be directly useful in evaluating pollutant-related stresses in aquatic environments. They are limited since they usually describe only one problem area (trophic level) within the system, and they often must be ramified, at considerable expense, before being applied to other similar environments. However, in specific types of aquatic environments, those stresses considered natural in nature, i.e., those created by oxygen-consuming wastes, are understood sufficiently to allow for the construction of total ecosystem models. Such models can account for the major functional changes such as respiration and nutrient regeneration as being functions of variables such as time and concentration. Although important, however, nonfunctional changes are less easily modeled; also, at the present time we lack sufficient knowledge to build models describing the effects of pollutants of unnatural origin. Bender considers biotic indices and eutrophication in detail to illustrate the current status of practical water quality models that deal with biotic responses. Although the examples presented can at best be considered as subsystem models, they are representative of the types of models being used to solve water pollution problems. (Bell-Cornell)
W74-05393

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 4A.
W74-05394

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
For primary bibliographic entry see Field 6A.
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
For primary bibliographic entry see Field 6B.
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 6A.
W74-05397

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

ACETYLENE-REDUCTION ASSAY OF ANAEROBIC NITROGEN FIXATION BY SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
A. N. Macgregor, and D. R. Keeney.
Journal of Environmental Quality, Vol 2, No 4, p 438-440, October-December 1973. 4 tab, 18 ref.

Descriptors: *Hardness(Water), *Nitrogen fixation, *Lake sediments, *Assay, Lakes, *Wisconsin, Sampling, Cycling nutrients, Anaerobic conditions.
Identifiers: *Acetylene reduction, Sample preparation, Lake Wingra, Lake Mendota, Tomahawk Lake, Trout Lake, Crystal Lake, Plum Lake, Lake Minocqua, Little John Lake.

Sediment samples were collected by Ekman dredge from 2 hardwater and six softwater lakes in Wisconsin for use in acetylene reduction tests to obtain a first approximation of the amounts of combined N added to lake sediments by anaerobic N fixation. To conduct the assay, sediment was transferred by syringe to 160-ml serum bottles containing 4-mm glass beads. The bottles were sealed with neoprene septa held firmly in place with aluminum seals. With the aid of hypodermic needles, each bottle was simultaneously flushed with a continuous flow of pure He and shaken so as to completely mix the beads and sediment. Ethylene, acetylene, and methane in the atmosphere above the sediment were determined after 1 and 2 days of incubation by gas chromatography. Rate of acetylene reduction indicated that, on the average, sediments from hardwater and softwater lakes may fix 37 and 7.7 ng of N, respectively, per gram (dry weight) per day. The rate of acetylene reduction diminished in the presence of nitrogenase inhibitors. (Little-Battelle)
W74-05400

5C. Effects Of Pollution

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04859

THERMAL EFFECTS ON BIOLOGICAL PRODUCTION IN A POND,
Wisconsin Univ., Madison. Dept. of Zoology.
H. F. Siewert.
Available from the National Technical Information Service as PB-228 659 $12.50 in paper copy, $1.45 in microfiche. Ph.D. Thesis, 1973. 172 p, 37 fig, 11 tab, 145 ref. (Issued by University of Wisconsin Water Resources Center, Madison) OWRR A-020-WIS(2). OWRR A-032-WIS(2). 14-01-0001-1870. 14-31-0001-3050.

Descriptors: Water chemistry, *Plant growth, *Chara, *Fishkill, *Nutrients, *Sunfishes, Oxygen, Alkalinity, Conductivity, Hydrogen, Sulfide, Stratification, Temperature, *Wisconsin, *Thermal pollution, Water pollution effects.
Identifiers: Thermal addition, *Fish growth, Food supply.

Physical, chemical, and biological differences between two similar ponds were studied. One pond was heated to 5C above ambient temperature, while the other served as a reference. Two hundred and fifty green sunfish, Lepomis cyanellus, were planted in each pond. The young-of-the-year grew at a higher rate in the heated pond and permitted Chara to grow year round at an accelerated rate. The heated pond produced more oxygen during the day and lost more oxygen during the night than did the reference pond. The

latter showed greater annual fluctuations of total alkalinity and conductivity. Concentration of hydrogen sulfide in the lower half of the water column, caused by stratification within the reference pond, killed fish in both the summer and winter periods. There was an indication that the synergistic effect of temperature and oxygen with an unlimited food supply will promote fish growth. W74-04861

OCEAN DUMPING IN THE NEW YORK BIGHT: AN ASSESSMENT OF ENVIRONMENTAL STUDIES,
Coastal Engineering Research Center, Fort Belvoir, Va.
G. Pararas-Carayannis.
Available from NTIS, Springfield, Va 22151 AD-766 721 Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum No 39, May 1973. 159 p, 50 fig, 21 tab, 117 ref.

Descriptors: *Water pollution sources, *Water pollution effects, New York, *Municipal wastes, *Continental shelf, Oceans, Environmental effects, Water pollution, *Waste disposal.
Identifiers: *New York Bight.

Short-term studies on effects of ocean dumping in the New York Bight include hydrographic, geological, chemical, biological investigations, and a feasibility study for a remote-controlled electronic sensing system to detect the location and dump status of waste disposal vessels. Circulation patterns were estimated by current meters and by seabed and surface drifters. Chemical analyses were made of the concentration of phosphorus, nitrate, total iron, dissolved oxygen, and chlorophyll-a. Temperature, salinity, turbidity, and pH were measured. Sediment samples were analyzed for organic content and the heavy metals, and biological samples for heavy metals and mercury. Included are studies of benthic meiofauna and macrofauna, zooplankton, finfish and bacteria and disposal of sewage sludge, dredge spoils and acid-iron wastes. Waste disposal results in an increase in the nutrient concentration of the waters of the dumping grounds, and the biochemical oxygen demand of the wastes during summer reduces the dissolved oxygen concentration of bottom waters. The studies defined areas with high carbonaceous content in the sediments, and correlated such carbon-rich deposits with sewage and dredge spoils dumped in the area, and with anomalously high concentration of heavy metals such as silver, chromium, cadmium, copper, lead, nickel, and zinc. The large volume of wastes being dumped in the Bight and frequency of dumping has changed the marine environment of the dumping grounds and adjacent areas. (Knapp-USGS)
W74-04863

ULTIMATE UPPER LETHAL TEMPERATURE OF ATLANTIC SALMON SALMO SALAR L.,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
E. T. Garside.
Canadian Journal of Zoology, Vol 51, No 8, p 898-900, August 1973. 1 tab, 8 ref.

Descriptors: *Atlantic salmon, *Lethal limit, *Water temperature, *Bioassay, *Thermal stress, Statistical methods, Freshwater, Mortality, Canada, Water pollution effects.
Identifiers: *Parr, Acclimatization, Probit analysis, Salmo salar, Data interpretation.

Thermal bioassays were conducted on parr of Atlantic salmon ranging from 70 to 147 mm total length (2.1-29.4 g) collected from a segment of 400 m immediately above high-tide elevation in Big Brook, Terra Nova National Park, Newfoundland, during early July, 1969. Temperature of the brook varied from 16 to 20C during the 3-day collecting period. Parr were maintained and acclimated in 75-liter glass aquaria containing water drawn from Big Brook. Acclimation was accomplished through the elevation of water temperature 0.5 degrees every 10 h from the temperature of collection with sensitive heater-thermostats until the desired level (27.5C) was achieved. Upper lethal temperature for the highest level of acclimation (27.5C) was calculated from percentage mortality, as a function of test temperature, using probit analysis in the biomedical program (BMDO35) adapted for CDC 6400 computer. The upper lethal temperature for acclimation 27.5C was determined to be 27.80C plus or minus 0.41 for 10,000 min exposure. There was no significant correlation (P much greater than 0.05) between size and order of death. (Holoman-Battelle)
W74-04869

SURVIVAL OF BROOK TROUT IN A BOG-DERIVED ACIDITY GRADIENT,
Pennsylvania State Univ., University Park. Dept. of Biology.
W. A. Dunson, and R. R. Martin.
Ecology, Vol 54, No 6, p 1370-1376, Autumn 1973. 8 fig, 1 tab, 8 ref.

Descriptors: *Brook trout, *Resistance, *Hydrogen ion concentration, *Bioassay, On-site tests, Acid streams, Water analysis, Bogs, Acidity, Electro-fishing, Acidic water, Fishing, Freshwater fish, Water sampling, Chemical analysis, Rainfall, *Pennsylvania.
Identifiers: Survival, *Acidity gradient, *Bear Meadows Bog(Penn), White sucker, Sinking Creek, Carbonic acid, Salvelinus fontinalis, Semotilus atromaculatus, Rhinichthys atratulus, Blacknose dace, Creek chub, Catostomus commersoni, Median tolerance limit.

Bear Meadows Bog water was analyzed to determine (1) if volatile acids were present, (2) the species of fish present at various pH's in the stream, and (3) the pH tolerance of hatchery brook trout placed in the stream at points where native fish were present or absent. The acidity of the bog water (pH 3.7-4.7) is not due to carbonic acid or to any other volatile acid. The approximate pK of the unknown bog water acid(s) is 6.0-6.5. Fish do not occur in Bear Meadows Bog or in Sinking Creek (the bog's only outlet) over a 4.8-km section below the bog where water pH is too low for their survival. The lowest pH in which brook trout and white suckers were caught in Sinking Creek was 4.25 at area 5 (5.25 km below the bog) after a period of unusually heavy rainfall. At a different time brook trout alone were caught at area 4, 5.2 km below the bog, when the pH was 4.75. The lowest recorded pH at this site was 4.0. Survival times of hatchery brook trout placed in boxes in Sinking Creek were directly related to pH. Individual differences in tolerance to low pH were quite marked, especially at pH's not rapidly lethal. Whether these individual differences are of environmental or genetic origin is not known. (Holoman-Battelle)
W74-04873

RESPIRATION OF A SUBLITTORAL COMMUNITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W74-04874

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2L.
W74-04875

PRIMARY PRODUCTION OF THE PERIPHYTON IN THE LITTORAL OF THE DANUBE,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Lab. of Fisheries and Hydrobiology.
M. Ertl, and J. Tomajka.
Hydrobiologia, Vol 42, No 4, p 429-444, September 28, 1973. 4 fig, 2 tab, 36 ref.

Descriptors: *Periphyton, *Primary productivity, Littoral, Rivers, *Biomass, Growth rates, Cultures, *Photosynthesis, Water levels, *Chlorophyll.
Identifiers: *Danube River, Chlorophyll a, Light and dark bottle method.

The gross primary production of periphyton, grown on artificial substrata in the littoral of the Danube, was measured by the light and dark bottle method from April, 1970 to March, 1971. The periphyton used for the measurements was sampled from various depths, in order to cover the production of the whole littoral. The highest primary production was always found in the zone just below the water level. Exceptions occurred only when this zone was inundated for a short time as a result of a temporary rise of the water level and the periphyton was insufficiently developed. In order to compare the values of primary production of periphyton obtained from shallower rivers, where the whole bottom is well illuminated, or from rivers that do not exhibit such frequent and extensive level oscillations as the Danube, average value calculated from results obtained from the zone closest to the water level at the time of measurements, were always used. Primary periphytic production in the surface zone was 43.8 mg 02/sq dm/day. Efficiency of gross photosynthesis in this zone was on the average 1.72 percent. The height of the water level and the water temperature were highly correlated with gross periphytic production. Close relationships between chlorophyll a content, biomass and gross primary production of periphyton were found. (Mortland-Battelle)
W74-04876

TIDAL STREAM DEVELOPMENT AND ITS EFFECT ON THE DISTRIBUTION OF THE AMERICAN OYSTER,
Delaware Univ., Lewes. Coll. of Marine Studies.
R. Keck, D. Maurer, and L. Watling.
Hydrobiologia, Vol 42, No 4, p 369-379, September 28, 1973. 8 fig, 1 tab, 21 ref.

Descriptors: *Oysters, *Tidal streams, *Distribution patterns, *Environmental effects, Meanders, Currents(Water), Scour, Deposition(Sediments), Dredging, Erosion.
Identifiers: American oyster, Crassostrea virginica, Current velocity, Delaware Bay, Macroinvertebrates.

This research was undertaken to determine the effect of tidal stream development on the distribution of the American oyster Crassostrea virginica. Data are presented on the effect of tidal stream formation on larval setting spat development, and maintenance of a healthy adult population. The four major oyster producing rivers in the state of Delaware are: the Leipsic, Murderkill, Mispillion, and Broadkill. In the majority of rivers the oyster producing sections extend 3500-4000 yards (3150-3600 m) from the river mouths. These sections were staked off in 100 yard (90 m) intervals. An oyster dredge with an approximate one meter mouth was towed over the right, middle, and left portions of each 100 yard (90 m) section. All live oysters (larger than 2 cm in height) were counted and measured to the nearest tenth of a centimeter. The total number of oysters per haul was used to plot the density of the oyster beds, and eventually to estimate the total number of bushels for each river. Dense populations are most often found associated with large meanders. The differential current velocities associated with meander formation result in areas of scour, which are beneficial to development of oyster beds; and areas of deposition, which are detrimental to survival of oysters. (Mortland-Battelle)
W74-04878

ULTRASTRUCTURE OF THE GREEN ALGA DICHOTOMOSIPHON TUBEROSUS WITH SPECIAL REFERENCE TO THE OCCURRENCE OF STRIATED TUBULES IN THE CHLOROPLAST,
Illinois Univ., Urbana. Dept. of Botany.
O. Moestrup, and L. R. Hoffman.
Journal of Phycology, Vol 9, No 4, p 430-437, December 1973. 10 fig, 19 ref.

Descriptors: *Aquatic algae, *Chlorophyta, *Cytological studies, Electron microscopy, Plant morphology, Aquatic plants.
Identifiers: *Dichotomosiphon tuberosus, *Ultrastructure, Chloroplasts, Vaucheria, Saprolegnia, Phycomycetes, Cytoplasmic streaming, Sample preparation.

The ultrastructure of the siphonous green alga Dichotomosiphon tuberosus (A. Br.) Ernst is compared with that of other siphonous plants. There is a characteristic association between the Golgi bodies and endoplasmic reticulum, but the mitochondria are not involved in the association as they are in Vaucheria and the phycomycete Saprolegnia. An unusual structure and arrangement of the chloroplasts is described as well as a previously unreported type of 'striated tubule' which occurs in most if not all chloroplasts and amyloplasts. The structure of these tubules is compared with that of other tubules recently found in green algae and higher plants. In addition, cytoplasmic microtubules arranged in the longitudinal direction of the siphon suggest a function in cytoplasmic streaming. (Holoman-Battelle)
W74-04881

THE PRODUCTION OF HYDROGEN PEROXIDE BY BLUE-GREEN ALGAE: A SURVEY,
Texas Univ., Austin. Dept. of Zoology.
S. E. Stevens, Jr., C. O. P. Patterson, and J. Myers.
Journal of Phycology, Vol 9, No 4, p 427-430, December 1973. 1 fig, 2 tab, 7 ref.

Descriptors: *Aquatic algae, *Cyanophyta, *Kinetics, Light, Nostoc, Cultures, Inorganic compounds.
Identifiers: *Hydrogen peroxide, *Axenic cultures, Photochemistry, Biosynthesis, Culture media, Algal physiology, Photoreduction, Photoproduction.

Thirty-eight axenic isolates of blue-green algae (Cyanophyta) were surveyed for hydrogen peroxide production. In order to avoid complications due to poor growth, three different culture media were used. Cells were grown in liquid culture on the chosen medium at 35C, with continuous agitation and 1 percent CO2 in air (v/v) bubbling through the culture. 5-25 w tungsten lamps were positioned 8 cm from the growth tubes in order to enhance peroxide production. Sixteen of the isolates (type I) showed no production of H202 within the sensitivity of the assay. Type II isolates showed no H202 production while in darkness, but at onset of illumination, H202 production was observed. After a short initial induction period, the rate of peroxide production remained steady until assay ingredients were exhausted or until light was extinguished. Type III isolates produced no H202 while in darkness, but at onset of illumination, displayed peroxide production with complex kinetics. Salient features included an initial lag, followed by a burst of period of rapid production of H202; the burst graded into a lower rate which then held steady. Type IV isolates differed markedly from all other assayed in that type IV algae produced H202 in darkness. Illumination of type IV cells caused an immediate increase in rate of H202 production. This increased rate continued without variation until light off. At light off, peroxide production dropped back to a rate equal to or sometimes slightly greater than the initial rate observed prior to illumination. The three kinetic profiles observed for peroxide formation are described. The possible site or sites of hydrogen peroxide formation remain unknown. (Holoman-Battelle)
W74-04882

SPECIES OF OCEANIC DINOFLAGELLATES IN THE GENERA DISSODINIUM AND PYROCYSTIS: INTERCLONAL AND INTERSPECIFIC COMPARISONS OF THE COLOR AND PHOTON YIELD OF BIOLUMINESCENCE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W74-04883

CHLOROPHYLL, NITROGEN, AND PHOTSYNTHETIC PATTERNS DURING GROWTH AND SENESCENCE OF TWO BLUE-GREEN ALGAE,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
R. J. Daley, and S. R. Brown.
Journal of Phycology, Vol 9, No 4, p 395-401, December 1973. 3 fig, 1 tab, 35 ref.

Descriptors: *Aging(Biological), *Chlorophyll, *Nitrogen, *Photosynthesis, *Plant growth, Plant pigments, *Cyanophyta, Aquatic algae, Instrumentation, Aquatic plants, Nitrates, Growth rates, Cultures, Electron microscopy, Light intensity, Nitrogen fixation.
Identifiers: Anacystis nidulans, Phormidium molle var. tenuior, Growth kinetics, Phycocyanin, Thylakoids, Senescence, Carotenoids, Ultrastructure, Culturing techniques, Organic nitrogen, Oxygen evolution.

A standardized, multiflask, batch culture system was developed to study the processes of algal senescence in Anacystis nidulans and Phormidium molle Gom. var. tenuior W. et G. West. Growth data over a 3-year period gave reproducible and comparable time-course curves. Although A. nidulans in unicellular and P. molle filamentous, the patterns of change with age were similar. Mean logarithmic doubling times and carbon yields were, respectively, 6.9 hr and 390 mg C/liter for A. nidulans and 7.2 hr and 710 mg C/liter for P. molle. Chlorophyll concentration and photosynthetic capacity per unit carbon rose rapidly during the logarithmic phase to maximum levels in either late log phase (P. molle) or early linear phase (A. nidulans), then fell throughout the declining growth phase to low levels in the stationary phase. Nitrate was rapidly exhausted from the medium during the period of logarithmic growth and stoichiometrically converted to particulate organic form; very little subsequent fixation of molecular nitrogen occurred. The phycocyanins were rapidly destoryed during the logarithmic phase while the carotenoids remained relatively constant throughout the whole growth period and then slowly declines. Preliminary electron micrographs showed a progressive deterioration in cellular ultrastructure, especially a reduction in the number of photosynthetic thylakoids, commencing in the linear growth phase. Analysis of the results suggests that occurrence of linear growth kinetics and termination of culture growth were caused by exhaustion of nitrate. The observed decreases in chlorophylls, phycocyanins, and photosynthetic capacity during active culture growth show that senescence effects may not be, as assumed, restricted to the stationary phase of growth. (Holoman-Battelle)
W74-04884

UREASE ACTIVITY OF ENTEROBACTERIACEAE: WHICH MEDIUM TO CHOOSE,
Ghent Rijksuniversiteit (Belgium). Lab. for Pharmaceutical Microbiology.
For primary bibliographic entry see Field 5A.
W74-04888

THE EFFECT OF THYROXINE AND TRIIODOTHYRONINE ON BACTERIAL GROWTH,
Bar-Ilan Univ., Ramat Gan (Israel). Dept. of Life Sciences.
For primary bibliographic entry see Field 5A.
W74-04891

EFFECT OF HELIUM GAS AT ELEVATED PRESSURE ON IRON TRANSPORT AND GROWTH OF ESCHERICHIA COLI,
Naval Medical Research Inst., Bethesda, Md.
N. A. Schlamm, J. E. Perry, and J. R. Wild.
Journal of Bacteriology, Vol 117, No 1, p 170-174, January 1974. 1 fig, 4 tab, 14 ref.

Descriptors: *E. coli, *Helium, *Environmental effects, *High pressure, *Iron, Growth rates, Hydrostatic pressure, *Bacteria.
Identifiers: 2 3-Dihydroxybenzoylserine, Culture media, 2 3-Dihydroxybenzoic acid, Ferric sulfate, EDTA.

Helium at an ambient pressure of 68 atm with 0.2 atm of O2 shortened by 1 to 1.5 h the lag phase for growth of Escherichia coli in minimal medium supplemented with 2 microliters of cell-free culture filtrate (CFF) per ml or with 1 microM 2,3-dihydroxybenzoylserine (DHBS), an iron chelator. The lag phase of cultures not exposed to helium could be shortened by use of supplements, but higher concentrations were required - 10 to 30 microliters of CFF per ml or 10 to 50 microM DHBS. Strain AN 193 of E. coli, which requires the DHBS precursor 2,3-dihydroxybenzoic acid (DHBA), grew well in media with 10 microM DHBA when exposed to helium at 68 atm, whereas 100 microM DHBA was required for growth in unexposed cultures. In the presence of 100 microM DHBA plus 1.0 microM ethylenediaminetetraacetic acid, growth was inhibited at 1 and 68 atm. Growth was restored, however, by the addition of 0.1 microM FeSO4 at 68 atm and 1.0 microM FeSO4 at 1 atm, but lag times were invariably shorter in the pressurized cultures. Hydrostatic pressures of 68 atm did not reduce the lag phase in the presence of CFF, DHBS, or DHBA. Results suggest that 68 atm of helium pressure, but not hydrostatic pressure, elicited a more rapid transport of iron into the cells. (Holoman-Battelle)
W74-04897

BIOLOGICAL RESPONSE TO DETERGENT AND NONDETERGENT PHOSPHORUS IN SEWAGE - PART I,
Utah Water Research Lab., Logan.
D. B. Porcella, P. A. Cowan, and E. J. Middlebrooks.
Water and Sewage Works, Vol 120, No 11, p 50-67, November 1973. 2 fig, 3 tab, 6 ref.

Descriptors: *Algae, *Detergents, *Growth rates, *Limiting factors, *Phosphorus, *Waste treatment, Bioassay, Chemical analysis, Domestic wastes, Nutrients, Water pollution effects, Nitrogen, Iron, Trace elements, Phosphates, Water pollution sources, Water treatment, Water pollution control.
Identifiers: Selenastrum capricornutum, Anabaena flos-aquae.

Sewage effluent from a suburban community of the City of Logan, Utah, was collected during times when detergents were and were not used to ascertain whether the elimination of phosphate detergents would affect algal growth. Algal bioassays were conducted with Selenastrum capricornutum and Anabaena flos-aquae using nutrient spikes to determine which nutrients were limiting. Bioassays were also performed using secondary treated detergent-free sewage samples spiked with detergent to observe whether any increase in biostimulation resulted. The nutrient spikes were NH4Cl, KH2PO4, Fe and trace elements, and NAAM solution for control. Chemical analysis of the sewage samples showed that restricted use of detergent resulted in a 57 percent decrease in phosphorus content; alum treatment also reduced phosphorus content. However, calculated phosphorus concentrations in the bioassay flask

or different dilutions of the secondary and tertiary effluents of the two sewage samples indicated the P content was high as a result of the high level of P in the reservoir water used for dilution. It is concluded that if the P content of the water is naturally high, the addition of more P will not affect algal growth. The results of the algal bioassays are not included. (Little-Battelle)
W74-04901

CHARACTERISTICS OF PHOSPHORUS DEFICIENCY IN ANABAENA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
F. P. Healey.
Journal of Phycology, Vol 9, No 4, p 383-394, December 1973. 10 fig, 3 tab, 74 ref.

Descriptors: *Anabaena, *Deficient elements, *Phosphorus, *Cytological studies, Plant physiology, *Assay, Cyanophyta, Plant growth, Bioindicators, Aquatic algae, Temperature, Hydrogen ion concentration, Light, Phosphates, Absorption, Carbohydrates, Bioassay, Nutrient requirements.
Identifiers: *Enzyme activity, Heterocysts, Alkaline phosphatase, Culture media, Substrate concentration, Chlorophyll a, Anabaena variabilis, Ribonucleic acid, Substrate utilization.

Several aspects of the metabolism and composition of a strain of Anabaena have been studied during phosphorus deficiency. The effects of medium composition, substrate concentration, temperature, pH, and illumination on alkaline phosphatase activity and phosphate uptake have been examined. Of particular interest among these results was the dependence of maximum alkaline phosphatase activity on Ca and of phosphate uptake on Mg. Depletion of dissolved phosphate from the culture medium was accompanied by a marked increase in alkaline phosphatase activity, initial rate of phosphate uptake, and total amount of phosphate taken up to satisfaction of the phosphorus debt. Readdition of phosphate to a phosphorus-deficient culture resulted in a rapid decline in the ability to take up phosphate but no loss of alkaline phosphatase beyond dilution of activity already present. Entry into phosphorus deficiency was accompanied by a loss of heterocysts, a decline in chlorophyll a, protein, RNA, and cellular phosphorus, and an increase in carbohydrate per unit dry weight. The possible use of these changes as physiological indicators of phosphorus limitation in natural situations is discussed. (Holoman-Battelle)
W74-04905

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04979

BOTTOM FAUNA OF GOLCUK LAKE. 1. POPULATION STUDY OF CHIRONOMIDS, CHAOBORUS AND OLIGOCHAETA,
Aegean Univ., Bornova (Turkey).
R. Geldiay, and I. U. Tareen.
Scientific Reports of the Faculty of Science No 137, 1972. 15 p, 5 fig, 2 tab, 9 ref.

Descriptors: *Diptera, *Oligochaetes, *Midges, *Benthic fauna, Eutrophication, Sands, Domestic wastes, Spatial distribution, Seasonal, Habitats, Oxygen, Hydrogen sulfide, Temporal distribution, Organic matter, Nematodes.
Identifiers: *Golcuk Lake(Turkey), Chironomus tentans, Chironomus plumosus, Chaoborus crystallinus, Tubifex tubifex, Chironomux anthracinus, Chaetogaster limnaei, Nais, Lumbriculus, Aelosoma, Stylaria fossularis, Enchytraeus, Ophidonais.

The study of bottom fauna, particularly Chironomid larvae, Chaoborus larvae, and Oligochaeta in Golcuk, a eutrophic mountain lake in western Turkey, emphasized their habitat preference for regions rich in organic matter and their depth distribution in different months. The lake, situated 20 km from the town of Odemis, is alkaline with mean pH value 7.3. Samples were taken for qualititative and quantitative analysis at three stations. In Station 2 population and seasonal variation studies were carried out. The sparse occurrence of the organisms was attributed to the sandy bottom. Where urban drainage from the village of Golcuk takes place, the bottom, characterized by organic mud, was the most productive region of the lake. Tubifex tubifex and Chironomus tentans were abundant and functioned as sewage indicators. The organisms are listed. Station 3, being purely sandy, was poorest in density composition. There was a considerable number of bottom fauna in the littoral which contained dense vegetation. Maximum bottom fauna were found in April. In September, during stratification, oxygen depletion and implementation of hydrogen sulfide caused a decline in total bottom fauna, but Oligochaeta and Chironomus tentans were resistant to hydrogen sulfide toxicity. Chaoborus larvae were most abundant in winter. (Jones-Wisconsin)
W74-05044

A BIOASSAY COMPROMISE,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. R. Cain, and F. R. Trainor.
Phycologia, Vol 12, No 3/4, p 227-232, 1973. 1 fig, 4 tab, 8 ref.

Descriptors: *Analytical techniques, *Bioassay, *Algae, Nutrients, Laboratory tests, Monitoring, Connecticut, Growth rates.
Identifiers: *Algal assay, Selenastrum capricornutum, Continuous cultures, Willimantic River(Conn), Natchaug River(Conn), Shetucket River(Conn).

Laboratory procedures are suggested for a quick, reliable, and uncomplicated measurement of the amount of algal growth a body of water can support (its carrying capacity). Selenastrum capricornutum was used as the test organism for assaying nutrient condition of waters. Using an actively growing culture, inoculated, sterile-filtered water was incubated at 22C in continuous fluorescent illumination. Organisms were grown in tubes on a roller tube rotator, and transferred daily, reestablishing a population of 400,000 cells each day. Averages of 5-day runs showed no evidence of nutrient carry-over when 1 + doublings per day were recorded; carryover usually was not apparent on days 3-5 when nutrient poor waters were examined. Samples were collected near the Willimantic, Connecticut sewage treatment plant at the confluence of Willimantic and Natchaug Rivers. Upstream the Willimantic River receives the discharge from several industries. Downstream from the treatment plant, the Shetucket River was also sampled. This study shows that growth rate of a defined population in a daily transferred culture may be used to measure the ability of surface waters to support algal growth. The procedure suggested meets the basic requirements of simplicity, speed, reproducibility, and applicability to field conditions. (Jones-Wisconsin)
W74-05045

FACTORS AFFECTING THE PHOTOSYNTHETIC CAPACITY OF LABORATORY CULTURES OF THE DIATOM PHAEODACTYLUM TRICORNUTUM,
La Trobe Univ., Bundoora(Australia). Dept. of Botany.
D. J. Griffiths.
Marine Biology, Vol 21, No 2, p 91-97, 1973. 4 fig, 1 tab, 3 ref.

Descriptors: *Photosynthesis, *Biochemistry, *Diatoms, Laboratory tests, Temperature, Chlorophyll, Enzymes, Light intensity, Plant growth.
Identifiers: Phaeodactylum tricornutum.

The relative importance of the two photosynthetic components, enzymatic reactions and light reactions, in controlling the photosynthetic capacity of laboratory cultures of Phaeodactylum tricornutum exposed to a variety of conditions is investigated, and, in a preliminary way, the possible mechanisms involved are explored. The light-saturated photosynthetic capacity of batch cultures of P. tri-cornutum grown in a regime of 16 h light and 8 h dark, reaches a maximum two days before the end of the exponential growth phase and declines thereafter. The fall-off of photosynthetic capacity is more rapid at a higher light intensity. Cultures exposed to a prolonged period of darkness maintain a high photosynthetic capacity. It is possible to reversibly reduce the photosynthetic capacity to a very low level, without significantly affecting the chlorophyll-a concentration by carefully controlling the conditions of dark incubation. Evidence from estimations of chlorophyll-a, total protein, and of the gross pattern of photosynthetic assimilation under different gread of Alberni Inlet and the influence of oceanic, species rich water drawn in through the inlet mouth by way of a subsurface counter current is postulated. (Jones-Wisconsin)
W74-05046

AN EXPERIMENTAL INVESTIGATION INTO EFFECTS OF PULP MILL EFFLUENT ON STRUCTURE OF BIOLOGICAL COMMUNITIES IN ALBERNI INLET, BRITISH COLUMBIA. PART 1: SUBTIDAL COMMUNITIES,
British Columbia Univ., Vancouver. Dept. of Zoology.
J. R. E. Harger, M. L. Campbell, R. Ellison, W. P. Lock, and W. Zwarych.
International Journal of Environmental Studies, Vol 4, No 4, p 269-282, 1973. 24 fig, 1 tab, 35 ref.

Descriptors: *Pulp wastes, *Estuaries, *Biological communities, Canada, Phytoplankton, Intertidal areas, Water pollution effects, Oxygen, Light intensity, Salmon, Light penetration.
Identifiers: *Alberni Inlet(British Columbia), Species diversity.

During the summer of 1971 an investigation into effects on biological communities of effluents discharged from a Kraft paper mill into Alberni Inlet on the west coast of Vancouver Island, British Columbia, was undertaken. The problem of separating effects of fresh water influence on developing communities from those attributable to pulp mill effluent was solved partly by setting a series of roughened formica test panels at a depth of 20 ft throughout the length of the inlet in order that settlement of sessile organisms could be recorded. These plates were also extended into a control area. Structure of communities developing on test panels was investigated using four analytical techniques. This structure indicated simplification, as measured by a number of indices relating to species diversity, and was associated with water transparency as well as other physical factors relating to effluent discharge. A dynamic interaction between influence of dark colored mill effluent in reducing phytoplanktonic production at the head of Alberni Inlet and the influence of oceanic, species rich water drawn in through the inlet mouth by way of a sub-surface counter current is postulated. (Jones-Wisconsin)
W74-05047

PRODUCTION OF A NATURAL POPULATION OF BITHYNIA TENTACULATA L. (GASTROPODA, MOLLUSCA),
Syracuse Univ., N.Y. Dept. of Zoology.
J. S. Mattice.
Ekologia Polska, Vol 20, No 39, p 525-539, 1972. 3 fig, 4 tab, 19 ref.

Descriptors: *Productivity, *Aquatic populations, *Snails, *Biomass, Life cycles, New York, Freshwater, Mortality, Standing crops.
Identifiers: *Bithynia tentaculata, Oneida Lake(N.Y.).

Productivity of a natural population of Bithynia tentaculata, a prosobranch gastropod mollusk, in eutrophic Oneida Lake, New York was estimated from standing crop biomass and mortality. It is a relatively recent immigrant to North America and is replacing the Pleurocerid in this climate. Biomass was estimated using two basic units: tissue dry weight and total organic carbon. Regular growth samples revealed that Bithynia lives for 17 to 18 months and shows a typical growth curve for a freshwater snail in a harsh temperate environment. Field density counts were combined with analyses of total organic carbon of snails at selected times of the year to yield assessments of population biomass. Mortality data, obtained from comparative density measurements and collections of empty shells made possible the estimate of carbon lost from the population over a 12 month period. The sum of the difference between the standing crop biomass in June of two consecutive years and the carbon lost to mortality in the interim gave a value for productivity of the population of 511 mg/C/sq m/year. (Jones-Wisconsin)
W74-05049

SPATIAL DIFFERENTIATION AND CHANGES IN TIME OF ZOOMICROBENTHOS IN THREE MASURIAN LAKES,
Warsaw Univ. (Poland). Zoological Inst.
K. Prejs, and A. Stanczykowska.
Ekologia Polska, Vol 20, No 45, p 733-745, 1972. 7 fig, 3 tab, 12 ref.

Descriptors: *Benthic fauna, *Lakes, *Spatial distribution, Temporal distribution, Microorganisms, Nematodes, Oligochaetes, Copepods, Crustaceans, Diptera, Dominant organisms, Littoral, Profundal zone.
Identifiers: *Mikolajskie Lake(Poland), Sniardwy Lake(Poland), Taltowisko Lake(Poland), Ostracoda, Tardigrada.

In a 6-year study of zoomicrobenthos of three Polish Masurian lakes, differences were recorded in samples between stations at the same depth, composition, and numerical dynamics in number and qualitative composition. Lake Mikolajskie is eutrophic, holomictic; Lake Sniardwy, eutrophic, polymictic; and Lake Taltowisko, mezotrophic, holomictic. The zoomicrobenthos groups distinguished were Nematoda, Oligochaeta, Copepoda, Cladocera, Ostracoda, Chironomidae, and Tardigrada. Differences in numbers were not great and were independent of density and qualitative composition. From littoral to profundal, the highest number was in the littoral, lowest in the sublittoral; a similar distribution of systematic groups in all profiles, constant domination of Nematoda in shallow parts and a decrease in their number with increasing depth, were found. Determination of changes in zoomicrobenthos number and composition during the 6 years at the same stations in the profundal zone showed that the polymictic Lake Sniardwy has a relatively constant number but domination of particular animal groups varies. Holomictic Mikolajskie Lake displays changes in number with a growth tendency in the last years but with a relatively constant domination of one group. (Jones-Wisconsin)
W74-05050

SPATIAL DIFFERENTIATION ABUNDANCE OF BACTERIA IN THE WATER OF MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
W. A. Godlewska-Lipowa, and I. Jablonska.
Ekologia Polska, Vol 20, No 28, p 367-371, 1972. 2 fig, 2 tab, 3 ref.

Descriptors: *Bacteria, *Lakes, *Spatial distribution, Sewage effluents, Microbiology.
Identifiers: *Mikolajskie Lake(Poland).

Water samples were taken in 12 places along the main axis of Mikolajskie Lake, Poland some distance from shore in the vicinity of municipal sewage flow and at the connection with lakes Sniardwy and Beldany. Samples were taken from surface to bottom every 2-5 m at each site. Filtered samples were analyzed to calculate total number of dominant bacteria, that is, cocciforms, rod-forms bacilla. The differences found between particular samples, and even particular filters, were relatively small. Bacteria numbers ranged within 4900-7900 thousands/ml of water on the lake surface and 4000-10,000 thousands/ml at other depths at the various stations. Greater abundance of bacteria was observed close to the municipal sewage inflows and at the connection with lakes Sniardwy and Beldany. Great bacterial abundance was found at the depths of 5 and 10 m, on a site possibly near sewage inflow. A considerable preponderance of cocci forms over the bacilliforms and rod-forms indicated that the organic substance flowing into the lake is easily assimilated and becomes quickly mineralized. There was a small percentage of positive Gram bacteria of bacilliform, ranging from 1-3% to 14%. (Jones-Wisconsin)
W74-05051

ASCORBIC ACID AND HETEROCYST DEVELOPMENT IN THE BLUE-GREEN ALGA ANABAENA AMBIGUA,
Banaras Hindu Univ., Varanasi (India). Lab. of Algal Physiology.
C. K. Wahal, N. C. Bhattacharya, and F. R. S. Talpasayi.
Physiologia Plantarum, Vol 28, No 3, p 424-429, 1973. 6 fig, 21 ref.

Descriptors: *Cytological studies, *Anabaena, *Organic acids, Nitrogen, Enzymes, Metabolism.
Identifiers: *Ascorbic acid, *Heterocyst production, Anabaena ambigua.

The role of ascorbic acid in heterocyst development is examined in a strain of Anabaena ambigua. It was cultivated with combined nitrogen and with molecular nitrogen. The amount of different forms of ascorbic acid found in the alga grown with and without combined nitrogen is given. The L-ascorbic acid content of the alga containing heterocysts was always higher than that present in the alga lacking the heterocysts, whether the alga was exposed to light or kept in darkness. The ratio of heterocysts to vegetative cells increased considerably under the influence of ascorbic acid. Thus it appeared that the effect of iso-L-ascorbic acid was about the same as that of L-ascorbic acid. Exogenously added ascorbic acid, up to 0.5 mg/ml, increased the heterocyst frequency to nearly three times that of the control. D-isoascorbic acid, an analogue of ascorbic acid, also showed an enhancement of heterocyst production. The exact location of the enzyme in the alga is not known although the heterocysts were earlier shown to contain ascorbic acid. Cytochemical tests, however, indicated strong peroxidase activity in the heterocysts. (Jones-Wisconsin)
W74-05052

SYNCHRONOUS CULTURES OF CHLAMYDOMONAS REINHARDTI: PROPERTIES AND REGULATION OF REPRESSIBLE PHOSPHATASES,
Bergen Univ., Norway. Botanical Laboratory.
T. Lien, and G. Knutsen.
Physiologia Plantarum, Vol 28, No 2, p 291-298, 1973. 11 fig, 20 ref.

Descriptors: *Cytological studies, *Chlamydomonas, *Enzymes, Phosphates, Phosphorus, Proteins, Synthesis.
Identifiers: *Repressible phosphatases, Derepression.

In synchronously growing Chlamydomonas cells, phosphatase activities in -P and +P medium, de novo synthesis (derepression) of phosphatase in cells grown in -P medium, variation in TCA soluble inorganic and organic phosphate during phosphatase derepression, and effect of orthophosphate and cycloheximide on derepression of phosphatase are reported. A double labelling isotope technique coupled with cellulose acetate electrophoresis were used. Repressed and derepressed phosphatase exhibited different enzymatic properties. Especially the acid phosphatase was located near the cell surface. Inorganic, cold TCA-extractable P-32, decreased during the first 1-2 h after phosphate deprivation when there was little or no net synthesis of phosphatase. Results of experiments with additions of orthophosphate and cycloheximide to derepressed cells, indicated that the derepressible enzyme was relatively unstable, while its m-RNA was relatively stable. Of ecological significance is the attachment of the enzyme to the cell surface, and the excretion of enzyme during sporulation. This may enable cells in growth media with low orthophosphate contents to hydrolyze extracellular phosphate esters and consequently increase the amount of available orthophosphate. This mechanism is made more efficient by the increased substrate affinity of the derepressed enzyme. (Jones-Wisconsin)
W74-05053

BIOMASS MONITORING OF ALGAL CULTURES BY FLUORIMETRIC MEASUREMENT OF THEIR CHLOROPHYLL CONTENT,
Swedish Water and Air Pollution Research Lab. Stockholm.
T. Larsson.
In: Proceedings from A Nordic Symposium, October 25-26, 1972, Oslo, Norway, p 59-61.

Descriptors: *Analytical techniques, *Algae, *Fluorometry, *Bioassay, Biomass, Monitoring, Cultures, Chlorophyll, Nutrients, Trace elements, Phosphates, Chelation.

The effects of trace elements, a chelating agent and phosphate on algal growth were studied in two factorial experiments. Scenedesmus quadricauda and Raphidonema spiculiforme were cultivated in media, whose concentrations of the above substances were varied simultaneously. Growth was measured by fluorimetric determinations of in vivo chlorophyll and sometimes also by microscopic cell count. Highly significant correlations were found between these two methods of biomass monitoring. Results of the experiments show that fluorimetric measurement of in vivo chlorophyll is a useful method for assessing growth in algal experiments. From the analysis of variance, and due to problems of using chlorophyll concentration to assess biomass, fluorimetric measurements of algal growth should be controlled by a method which measures biomass more accurately, for instance by analysis of cell carbon or cell counting with an electronic particle counter. It is thus important to measure biomass with one of these methods at a time when the analytical result will give much information concerning the objectives of the experiment. Such a time can be chosen with the guidance of fluorimetric determination of in vivo chlorophyll. (Jones-Wisconsin)
W74-05055

FIELD EXPERIMENT ON THE FACTORS CONTROLLING PRIMARY PRODUCTION OF THE LAKE PLANKTON AND PERIPHYTON,
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
A. Hillbricht-Ilkowska, A. Kowalczewski, and I. Spodniewska.
Ekologia Polska, Vol 20, No 25, p 315-326, 1972. 2 fig, 1 tab, 10 ref.

Descriptors: *Primary productivity, *Lakes, *Plankton, Periphyton, Photosynthesis, Alg

Spatial distribution, Light penetration, Eutrophication, Chlorophyll, Diatoms.
Identifiers: Mikolajskie Lake(Poland), Phaeophytin.

Two experiments with plankton and one with periphyton in Mikolajskie Lake of the Masurian Lakeland were conducted to distinguish the influence of light on algae production at various depths. Plankton was sampled at 8 different depths; periphyton from Potamogeton perfoliatus leaves at 5 depths. Primary productivity was estimated by the light-dark bottle technique. Oxygen, chlorophyll, and phaeophytin were determined; total biomass and dominant species estimated. Diatoms were dominant in plankton and many small forms were found during the spring experiment. Algal biomass was then about 5.0 mg/l, and vertical distribution of algae from 0 to 15 m of depth was relatively uniform. Dominance of dinoflagellates was observed during the summer experiment with plankton. Visible concentrations of dinoflagellates capable of active movements were found in the layers 1-2 m and 6-8 m. In both plankton experiments there were no basic differences in species composition of algae at particular depths. Plankton collected from all depths during the spring experiment, including the samples from 10 and 15 m, showed similar production values at all suspension depths. Results suggest varying photosynthetic algal activities from different depths. Highest photosynthetic activity in the summer plankton was found at depths of 3 and 5 m. (Jones-Wisconsin)
W74-05056

PROBLEMS OF THE CONSERVATION OF FRESHWATER ECOSYSTEMS,
Nature Conservancy, Edinburgh (Scotland).
N. C. Morgan.
In: 'Conservation and Productivity of Natural Waters,' Symposia of the Zoological Society of London, No. 29, p 135-154. Academic Press, London, 1972.

Descriptors: *Water conservation, *Preservation, *Natural resources, Management, Europe, Wetlands, Protection, Reservoirs, Water policy, Aquatic life, Estuaries, Wildlife, Recreation, Water pollution effects, Agriculture, Forestry, Insecticides, Herbicides, Farm wastes, Aesthetics, Aquatic plants, Systematics.
Identifiers: *Nature Conservancy(Scotland), United Kingdom, Chalk aquifers.

The discussion centers on the major problems in the United Kingdom and some of the steps taken by the Nature Conservancy and other organizations in conserving freshwaters with the intention of maintaining their scientific interest or rehabilitating their physical, chemical, or biological quality. With the objective to select a series of high quality sites as National Nature Reserves to represent the range of variation of this habitat, reference is made to the problems of water abstraction and storage reservoirs with their varying water levels resulting from specific usage. The effects of irrigation and abstraction of water from chalk aquifers and their effects on river flow, and increasing pressures to use open water for recreation and the consequent effects on conservation of habitat and wildlife particularly near large cities are discussed as well as domestic pollution and the effects of various agricultural practices, particularly in relation to nutrient levels in drainage water. The decline of aquatic vegetation in some water bodies is recorded and possible causes mentioned. The extensive use of herbicides for clearing drainage ditches and the side effects on other components of the ecosystem are considered. (Auen-Wisconsin)
W74-05057

BIOENERGETICS OF THE ASSIMILATING CELLS OF CHLORELLA PYRENOIDOSA CHICK. II. RELATION OF CYCLIC AND NON-CYCLIC PHOTOPHOSPHORYLATION TO PHOTOSYNTHETIC CO2 FIXATION,
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
T. A. Glagoleva, M. V. Chulanovskaya, and O. V. Zalenskii.
Photosynthetica, Vol 6, No 4, p 354-363, 1972. 3 fig, 2 tab, 34 ref.

Descriptors: *Chlorella, *Biochemistry, *Photosynthesis, Cycles, Cytological studies, Light, Carbon cycle.
Identifiers: *Photophosphorylation, Calvin cycle.

Regular changes of relative rates of cyclic and non-cyclic photophosphorylation were investigated and compared with rates of photosynthetic carbon dioxide fixation and oxygen evolution under varying irradiance and temperature. Rate of photoassimilation of glucose was determined by counting the radioactivity of Chlorella pyrenoidosa cells starved of carbohydrates. Rate of starch biosynthesis was estimated by C-14 incorporation. At 670 nm rate of carbon dioxide fixation was 3 times greater at 38C than at 10C and the incorporation of C-14 into starch 2.8 times. Incorporation of C-14 into starch at 714 nm depends on temperature only between 10-20C. From these tests, the relative contribution of cyclic photophosphorylation in the processes immediately unrelated to the Calvin cycle can be estimated. These data testify that interrelations of energy sources in uptake of substances and ions and in the biosynthesis of macromolecules (polysaccharides and proteins) vary under different experimental conditions. Upon increase in rate of photosynthetic gas exchange, relative contribution of non-cyclic photophosphorylation to the realization of these processes also increases and under a certain set of conditions can amount to half of the 'summary' rate of photophosphorylation. (Jones-Wisconsin)
W74-05059

AERATION SYSTEM REVITALIZES LAKES.
Civil Engineering, American Society of Civil Engineers, May 1971. p 107. 1 fig.

Descriptors: *Aeration, *Lakes, *Rehabilitation, Oxygenation, Destratification, Ohio, Illinois, Michigan, Algal control, Freezing, Waste water treatment, Technology.
Identifiers: *Air Aqua systems.

If enough wastes are dumped into a lake, there comes a point when oxygen consumption of wastes and decaying algae is greater than oxygen introduced from air and by living algae. Then even natural exchanges of water strata cannot provide adequate oxygen. During the past decade, several decaying lakes in the Midwest have been restored to healthy conditions through use of the 'Air-Aqua' aeration system which introduces air to the lake bottom. This system overcomes eutrophication by artificially inducing vertical circulation of lake water and thus increasing the oxygen content of the bottom water layer. The small size of the bubbles is the key to the system as tiny bubbles dissolve oxygen more quickly into the bottom water than would those of large diameter. Not only does a large turnover of water occur in a short time, but no turbulence is created thus no sediment is brought to the surface. Three applications of the system in Ohio, Illinois, and Michigan are given, illustrating its ability to restore decaying lakes to balanced ecosystems in which fish and water fowl can thrive. (Jones-Wisconsin)
W74-05060

NUTRIENT STUDIES IN HYPERFERTILIZED ESTUARINE ECOSYSTEMS. I. PHOSPHORUS STUDIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
W. Abbott.
Advances in Water Pollution Research, Vol 4, No II-3240, p 729-739, 1970. 2 fig, 5 tab, 27 ref. FWPCA Grant WP-01030-01.

Descriptors: *Eutrophication, *Phosphorus, *Cycling nutrients, Phosphorus compounds, Nitrates, Productivity, Photosynthesis, Respiration, Ecosystems, Chlorophyll, On-site laboratories.
Identifiers: *Orthophosphate, Total phosphate.

It was established on a pseudokinetic, long-term basis that some experimental systems assimilated exogenous dissolved orthophosphate according to a first-order, presumptively sorption-limited, reaction scheme. Further, photosynthetic production and community respiration were correlated with nitrate and phosphate fertilization. Relevant field studies are reported. Three forms of phosphorus were defined: dissolved, labile, and bound. Analyses were carried out for orthophosphate or total phosphate on each phosphorus fraction. Of nitrogen forms, only nitrate was monitored. Eighteen experimental ponds were constructed by capturing a small bayou channel and fertilized. Trends evident by passage of P-32 through the pond environment suggest a steady-state ecological phosphorus processing machine. Differences between fertilized and control ponds indicate that a demand system probably controls allocations to various ecosystem sub-units. From this standpoint, at least relative to phosphorus, an estuary is not a 'nutrient trap' but is, rather, a 'nutrient buffer' tending to modulate phosphorus flow through the ecosystem while obviating wild fluctuations in the phosphorus economy. Sediments, in this context, are the phosphorus stockpile. Periodically, turbulence effects cycle part of this stored reserve. Metabolic demands within the community may withdraw any required phosphorus from the flux and the excess is soon returned to the stockpile. (Jones-Wisconsin)
W74-05061

TROPHIC RELATIONS OF AQUATIC INSECTS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
Annual Review of Entomology, Vol 18, p 183-206, 1973. 6 fig, 3 tab, 72 ref.

Descriptors: *Animal behavior, *Trophic level, *Aquatic insects, *Food habits, Nutrients, Respiration, Food chains, Energy budget, Cycling nutrients, Systematics, Freshwater, Digestion, Diptera.
Identifiers: Hemiptera, Tanypodinae, Orthocladinae, Diamesinae.

Successful rehabilitative or management strategy of freshwater ecosystems must rely on knowledge of their structure and function. A basic facet is material cycling and energy flow. Significant portion of such cycling and flow involves processing of various forms of organic matter by freshwater invertebrate animals, especially insects, substantiating the interest in aquatic insect trophic relations-food intake, tissue assimilation, and waste release. Nutritional requirements of aquatic insects may be broadly classed as two somewhat distinct problems: intake of adequate calories to meet immediate energy costs and to accumulate energy stores; and sufficient procurement of protein to sustain adequate growth. Differences within a single species are reported. Discrepancies in food habits of the net-spinning caddis larva, Hydropsyche betteni, are described. In addition to trophic differences between two populations of the same species from different locations, age-specific variations within the same population are indicated. In general, Tanypodinae are predaceous, Orthocladinae are detrital-algal feeders, Diamesinae are algal feeders, and Chironomidae are algal-detrital feeders with some leaf mining and predaceous species. The contention is supported that most aquatic insects are best termed polyphagous or generalists and that availability, usually delineated by food particle size and texture, is the key to trophic relationships among aquatic insects. (Jones-Wisconsin)
W74-05062

CONTROL OF ALGAE BY MIXING,
New Hampshire Water Supply and Pollution Control Commission, Concord.
For primary bibliographic entry see Field 5G.
W74-05064

PHOTOSYNTHETIC RATES IN RELATION TO NITROGEN RECYCLING AS AN ADAPTATION TO NUTRIENT DEFICIENCY IN PEAT BOG PLANTS,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
E. Small.
Canadian Journal of Botany, Vol 50, No 11, p 2227-2233, 1972. 2 fig, 2 tab, 5 ref.

Descriptors: *Cycling nutrients, *Nitrogen, *Bogs, *Plants, Deficient elements, Peat, Absorption, Phosphorus, Potassium, Leaves, Photosynthesis.
Identifiers: Ottawa(Canada), Evergreen plants, Deciduous plants.

Bog evergreens may primarily represent a mechanism to retain and use nutrients. Perennial leaf duration, high reabsorption of nutrients before leaf fall, and high rates of photosynthesis contribute to maximum use of an acquired unit of nutrient element. Efficiency of the interaction of these three factors in evergreens as contrasted with deciduous species, and in bog species as compared with species of other habitats, is examined. Fifteen species in a raised sphagnum peat bog were compared with 13 non-bog species with respect to light-saturated net photosynthetic rate, and content of N, P, and K within foliage and leaf litter. Bog species reabsorb a greater proportion of the nitrogen from their leaves preceding leaf fall, than do non-bog deciduous species. When bog deciduous species are compared with non-bog deciduous species, they are potentially capable of manufacturing an average of about 60% more photosynthate for an acquired unit of nitrogen. Bog evergreens can potentially manufacture an average of about 235% more photosynthate per acquired unit of nitrogen than can bog deciduous species. (Jones-Wisconsin)
W74-05065

LIMNOLOGICAL SURVEY OF LAKES MICHIGAN, SUPERIOR, HURON AND ERIE,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, and J. C. Roth.
Publication No. 17, 1973. 108 p, 15 fig, 35 tab, 143 ref, 1 append.

Descriptors: *Limnology, *Great Lakes, *Biological communities, *Biological properties, *Physicochemical properties, Lake Michigan, Lake Superior, Lake Huron, Lake Erie, Analytical techniques, Water temperature, Light penetration, Dissolved oxygen, Alkalinity, Ions, Nutrients, Chlorophyll, Photosynthesis, Phytoplankton, Benthos, Zooplankton, Systematics, Bottom sediments.

Extensive physical, chemical, and biological information was gathered with uniform methods from 87 stations in Lakes Michigan, Superior, Huron and Erie in the summer of 1970. Data include temperature, transparency, dissolved gasses pH, alkalinity, major ions, nutrients, chlorophyll, carbon fixation by phytoplankton, zooplankton, and benthos. On the basis of limnological characteristics, the lakes are divided into ten distinct geographical zones and data on some of the parameters are compared for the ten zones. Temperature regimes vary greatly due to latitude, depth, and sampling time. In the central basin of Lake Erie, the mean surface temperature was compared with the mean concentration of dissolved oxygen. Calcium and alkalinity values are largely controlled by mineralogical characteristics of the drainage basins, whereas inputs of sulfate and chloride are largely urbanization and industrialization products. Absolute levels of silica and nitrate nitrogen in Lake Huron are controlled largely by nutrient concentrations in inputs from Lakes Michigan and Superior. Depletion of silica and nitrate in the epilimnion increases with increasing eutrophication. The lakes ranking in order of most oligotrophic to most eutrophic are Superior, Huron, Michigan, and Erie, with Saginaw Bay being as eutrophic as parts of Lake Erie. (Jones-Wisconsin)
W74-05067

HYDROBIOLOGICAL STUDIES 2.
Ceskoslovenska Akademie Ved, Prague.
Academia Publishing House of the Czechoslovak Academy of Sciences, Prague. 1973. 348 p, 154 fig, 62 tab, 322 ref.

Descriptors: *Hydrobiology, *Limnology, *Hydrology, *Chemical properties, *Physical properties, *Biological communities, Primary productivity, Plankton, Benthos, Model studies, Stratification, Hydrodynamics.
Identifiers: *Vltava Cascade(Czechoslovakia), Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vrane Reservoir(Czechoslovakia), Stechovice Reservoir(Czechoslovakia), Sazava River(Czechoslovakia).

Results of 10-year systematic observations of the limnology of riverine Slapy Reservoir and the Vltava Cascade consisting of a chain of three main reservoirs and four re-regulation reservoirs in Czechoslovakia are discussed. Critical periods enabling determination of underlying cause and effect relationships were revealed and the complex reservoir hydrodynamics are evaluated. An empirical thermal model for an isolated reservoir and a reservoir in the cascade is calculated. The changes that occurred in the Slapy Reservoir after filling of the new Orlik Reservoir, located above Slapy on the Vltava River, are indicated. Also discussed are the phytoplankton species and their activity and how benthic observations on Slapy Reservoir showed wide differences in organic matter supply and the cessation of this supply after upstream Orlik Reservoir became operative. Fish feeding activity in the littoral, sublittoral and the profundal zones was studied. Investigation results are reported of two re-regulation reservoirs with short retention times and differing inflowing waters. Primary production in relation to discharges and stratification, and quantitative relation of phyto- and zooplankton are indicated and whether the chemical or bacteriological composition of water is changed after passage through a reservoir with short retention time, and if some features characteristic of static waters develop. (See W74-05069 thru W74-05074) (Jones-Wisconsin)
W74-05068

EFFECT OF AN UPSTREAM RESERVOIR ON THE STRATIFICATION CONDITIONS IN SLAPY RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
M. Straskraba, J. Hrbacek, and P. Javornicky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 7-82. 36 fig, 5 tab, 81 ref.

Descriptors: *Reservoirs, *Thermal stratification, Dissolved oxygen, Hydrogen ion concentration, Alkalinity, Seasonal, Temperature, Heat budget, Mathematical studies, Hydrology, Water flow, Air temperature, Light penetration, Chemical stratification, Hydrodynamics.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vltava Cascade(Czechoslovakia).

How basic physical and chemical limnology changes when a primarily isolated high discharge-volume riverine reservoir becomes a lower part of a cascade, and the effect of an upstream reservoir on stratification and horizontal distribution of basic physical and chemical values of the original reservoir (Slapy) in the Vltava Cascade were studied. As derived from direct comparison of two medium discharge years, the shift in time of temperature maxima of the outflowing river is doubled and there is a twofold winter temperature increase in the post-Orlik period. A similar shift of surface seasonal maxima and increase of winter temperatures was observed. Stratification was more pronounced and epilimnium thicker in the post-Orlik years. The S-shaped dissolved oxygen, pH and alkalinity depth curves resulting from layering of the inflow to intermediate depth changed to regular curves when deep cold water of Orlik fed Slapy. During the years when Orlik was operating the minimum heat content and minimum surface temperatures were linearly positively dependent on the minimum monthly mean air temperature which in turn is a positive logarithmic function of winter discharges. The complex hydrodynamics of reservoirs is discussed. An empirical thermal model for an isolated reservoir and a reservoir in the cascade is obtained. (See also W74-05068) (Jones-Wisconsin)
W74-05069

CHANGES OF SOME CHEMICAL CONSTITUENTS AND BACTERIAL NUMBERS IN SLAPY RESERVOIR DURING EIGHT YEARS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
L. Prochazkova, V. Straskrabova, and J. Popovsky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 83-154. 35 fig, 15 tab, 66 ref.

Descriptors: *Chemical properties, *Bacteria, *Reservoirs, Eutrophication, Phosphorus, Ammonia, Nitrogen, Chemical oxygen demand, Biochemical oxygen demand, Biomass, Organic matter, Primary productivity, Coliforms, Decomposing organic matter, Discharge(Water), Conductivity, Alkalinity, Chlorides.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vltava River(Bohemia).

Changes that occurred in Slapy Reservoir after filling of the new Orlik Reservoir, located above Slapy on the Vltava River, Czechoslovakia were evaluated together with other external and internal factors on long-term changes in chemical and bacteriological characteristics of the reservoir surface. Nitrate concentration increased steadily with increased nitrogen fertilization in the river drainage area. About 25% of the total nitrogen supplied in fertilizers and atmospheric precipitation entered the reservoir; increase of phosphorus fertilizers had no effect on the total phosphorus in the reservoir. A significant indirect correlation of primary production with ammonia-nitrate concentration was observed. An indirect correlation was found between primary production and phosphate phosphorus concentration. The N/P ratio increased after the construction of Orlik Reservoir to about 40. The sums of COD, BOD-5 corrected for algal biomass, direct counts on beef-pepton agar (BPA) 10 days and 5 days coliforms showed direct significant correlation to mean water discharge. The effect of Orlik Reservoir on decrease of COD and BPA-10 bacteria at the Slapy Reservoir surface was observed at the beginning of the second year after filling of Orlik; on direct bacteria counts from the third year, and on BOD from the fourth year onwards. (See also W74-05068) (Jones-Wisconsin)
W74-05070

THE CHANGES IN SEVERAL PARAMETERS OF PLANKTON PRIMARY PRODUCTIVITY IN SLAPY RESERVOIR 1960-1967, THEIR MUTUAL CORRELATIONS AND CORRELATIONS WITH THE MAIN ECOLOGICAL FACTORS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.

P. Javornicky, and J. Komarkova.
In: 'Hydrobiological Studies 2, 'Academia Publishing House, Prague. 1973. p 155-211. 33 fig, 6 tab, 55 ref.

Descriptors: *Plankton, *Primary productivity, *Reservoirs, Phytoplankton, Photosynthesis, Biomass, Chlorophyll, Algae, Solar radiation, Temperature, Phosphorus, Discharge(Water), Seasonal, Diatoms, Anabaena, Stratification, Cyanophyta, Light penetration, Chlorophyta.
Identifiers: *Slapy Reservoir(Czechoslovakia), Vltava Cascade(Czechoslovakia).

Results of an 8-year study of Slapy Reservoir, Czechoslovakia are given in connection with phytoplankton species, phytoplankton photosynthetic activity relationahip to biomass percentage of main phytoplankter groups, seasonal changes in parameters of plankton primary productivity, seasonal average of these parameters, mutual correlations between these parameters, and correlations between parameters of plankton primary productivity and several ecological factors. Cell volumes of most abundant phytoplankton species are tabulated. Species of algae dominating the phytoplankton biomass in the surface 3-m layer (trophogenic zone) at the standard sampling station during three main periods of the eight seasons of vegetation are listed. Two coefficients of photosynthetic activity of phytoplankton, namely turnover rate in situ and activity in vitro, are considered. Seasonal patterns and their changes during the years investigated are shown and analyzed. The differences between the seasonal averages were tested and the averages as well as the individual data are correlated both mutually and with the following ecological factors: incident solar radiation energy, Secchi disc readings, water temperature, concentration of total phosphorus, and discharge of reservoir water. The last two factors are demonstrated to be the most important for plankton primary productivity in Slapy Reservoir. (See also W74-05068) (Jones-Wisconsin)
W74-05071

THE CHANGES OF BENTHOS IN SLAPY RESERVOIR IN THE YEARS 1960-1961,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
V. Hruska.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 213-247. 10 fig, 10 tab, 62 ref.

Descriptors: *Benthos, *Reservoirs, Temporal distribution, Oligochaetes, Diptera, Tripton, Tubificids, Littoral, Profundal zone, Biomass, Benthic fauna, Organic matter.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia).

In two consecutive years of benthic observations of Czechoslovakia Slapy Reservoir there were wide differences in organic matter supply brought into the reservoir by the Vltava River. This supply ceased in the second year after upstream Orlik Reservoir became operative. Benthic abundance and biomass were observed at transects 9 km and 33 km above Slapy dam. Additional samples were taken 35 km above the dam. Experiments with four protected bottom areas against fish predation were conducted at the 9 km transect. In 1960, benthos was quantitatively richest in the profundal of both transects. Oligochaeta were most important. In 1961 with the retention of river tripton in the upper Orlik Reservoir the huge quantities of Oligochaeta disappeared from the 33 km transect. The lower profundal became quantitatively the richest zone and changes of abundance and biomass differed from those in the preceeding year. Protection of the bottom areas against fish feeding indicated that differences between the quantitatively poor benthos in the littoral and sublittoral and rich benthos in the profundal must be ascribed to the better food conditions rather than to fish predation. (See also W74-05068) (Jones-Wisconsin)
W74-05072

LIMNOLOGY OF TWO RE-REGULATION RESERVOIRS IN CZECHOSLOVAKIA,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
M. Straskraba, and P. Javornicky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 249-316. 34 fig, 9 tab, 37 ref.

Descriptors: *Limnology, *Reservoirs, *Thermal stratification, *Temperature, Biomass, Temporal distribution, Stratification, Mathematical models, Phytoplankton, Zooplankton, Chlorophyll, Photosynthesis, Standing crops, Hydrology, Oxygen, Hydrogen ion concentration, Alkalinity, Nutrients, Primary productivity, Discharge(Water).
Identifiers: *Re-regulation reservoirs, Vltava Cascade(Czechoslovakia).

Investigations of two re-regulation reservoirs with short retention times, differing in inflowing water, are reported. Analysis was made of seasonal temperatures and an empirical temperature model developed for Czechoslovak Vltava Cascade and primary production in relation to discharges and stratification, and quantitative relation of phyto- and zooplankton studied. During two years of direct study and evaluation of 10-year data, temperature change within the poorly stratified water mass of the re-regulation reservoir was found to correlate with the air-water temperature gradient and retention time. In the re-regulation reservoir receiving a tributary river in addition to the upper reservoir outflow, the temperature changes were correlated with the mixing of the two inflowing water masses. Species composition, abundance and standing crop of phyto- and zooplankton, as well as the chlorophyll-a content and photosynthetic activity of phytoplankton are explained in connection with the phytoplankton origin of the re-regulation reservoir from the depths of the upstream reservoir. Log ratio phytoplankton production/zooplankton standing crop was found to increase logarithmically in reservoirs with renewal times more than 20 days, but to be renewal independent in highly throughflowing reservoirs. (See also W74-05068) (Jones-Wisconsin)
W74-05073

THE INFLUENCE OF TWO RE-REGULATION RESERVOIRS ON THE CHEMICAL AND BACTERIOLOGICAL PROPERTIES OF RIVER WATER,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
V. Straskrabova, L. Prochazkova, and J. Popovsky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 317-348. 10 fig, 14 tab, 21 ref.

Descriptors: *Reservoirs, *Chemical properties, *Bacteria, *Rivers, Hardness(Water), Coliforms, Phosphates, Chemical oxygen demand, Biochemical oxygen demand, Phosphorus, Nitrogen, Conductivity, Discharge(Water), Tributaries, Primary productivity, Retention, Nitrates, Ammonia.
Identifiers: *Re-regulation reservoirs, Vrane Reservoir(Czechoslovakia), Slapy Reservoir(Czechoslovakia), Stechovice Reservoir(Czechoslovakia), Vltava River(Czechoslovakia), Sazava River(Czechoslovakia), Vltava Cascade(Czechoslovakia).

Whether the chemical or bacteriological composition of river water is changed after passage through a reservoir with short retention time (several hours to several days) and whether some features characteristic of static waters develop in such reservoirs were investigated. Of the two reservoirs on the Vltava River above Prague, a segment of the Vltava Cascade, Stechovice is supplied by outflow of Slapy Reservoir and Vrane is filled by the Vltava River flowing from Stechovice and by tributary Sazava River. Only significant changes found in the water after passage through Stechovice Reservoir were increases in total hardness, organic nitrogen, and coliform bacteria, and decreases in phosphate-phosphorus, COD and BOD-5. Water passing through Vrane Reservoir showed a significant decrease in COD during low discharge only and an increase in total phosphorus and phosphate-phosphorus, organic nitrogen, specific conductivity, BOD-5, and in numbers of bacterial groups. Bacterial numbers showed an indirect proportion to Vlt ava River discharge. Difference between the BOD-5 concentration in outflow and inflow of Stechovice Reservoir correlated directly with retention time. Difference in ammonia nitrogen concentration in the outflow and inflow of Vrane Reservoir correlated indirectly with primary production of phytoplankton and directly with both discharge of Sazava River and the percentage in the total reservoir discharge. (See also W74-05068) (Jones-Wisconsin)
W74-05074

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED, AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, and R. R. Stickney.
Available from the National Technical Information Service as AD-757 717 $6.00 paper copy, $1.45 in microfiche. Army Engineer District, Savannah, Georgia, Report April 1972. 373 p, 170 fig, 49 tab, 16 ref.

Descriptors: *Environmental effects, *Dredging, *Salt marshes, *Dikes, *Spoil banks, Deposition(Sediments), Water quality, Sediments, Biota, Georgia, Coasts, Metals, Estuaries, Aquatic plants, Benthos, Periphyton, Computer programs, Trace elements, Oxidation-reduction potential, Hydrogen ion concentration, Sulfides, Invertebrates, Mathematical studies.
Identifiers: Spartina alterniflora, Diversity indices, Intracoastal waterways, Savannah River(Ga.), Hell Gate(Ga.), Thunderbolt(Ga.).

Nature and magnitude of environmental changes resulting from dredging activities in salt marsh-estuarine environments of the southeastern Atlantic coast are evaluated. Water quality changes where diked and undiked techniques were used, salt marsh sediment responses to deposition of dredged material, and changes in biota were studied where dredging took place. It is concluded that in natural and relatively unpollutted areas dredging has no significant effect on water quality where either diked or undiked techniques were used; in polluted areas, water quality impairment caused by dredging does not necessarily bear any simple relation to composition of sediment to be dredged. Since distribution of trace metals (micronutrients) in various valence states in marsh sediments has a characteristic distribution pattern with depth dependent on Eh, pH, and sulfide, changes occurring in the latter parameters during spoil material deposition can greatly affect distribution of the former. Combination of reduced sediments and micronutrients may be important to the healthy maintenance of the salt marsh plant, Spartina alterniflora. Analyses of data indicate that no effects of dredging on the fishes and macroinvertebrate fauna within the 1971 dredge areas along the Intracoastal Water Ways of Georgia could be delimited. (Jones-Wisconsin)
W74-05075

WORKBOOK OF THERMAL PLUME PREDICTION: VOLUME 1, SUBMERGED DISCHARGE,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B.

W74-05111

HISTOCHEMICAL AND CYTOPHOTOMETRIC ASSAY OF ACID STRESS IN FRESHWATER FISH.
Pennsylvania State Univ., University Park. Dept. of Biology.
Copy available from GPO Sup Doc as EP1.16:18050OXJ05/4, $1.25; microfiche from NTIS as PB-227 571, $1.45. Environmental Protection Agency, Water Pollution Control Research Series, May 1971. 113 p, 32 fig, 18 tab, 66 ref. EPA Grant No. 18050DXJ.

Descriptors: Fish physiology, *Bioassay, *Acidic water, Water pollution effects, Pennsylvania, Analytical techniques, Microscopy, Bioindicators, Toxins, *Brook trout, Minnows, Spectrophotometry, Spectroscopy, *Fish pathology.
Identifiers: *Fish histochemistry, Analytical histochemistry, Cytophotometry, *Longnose dace, *Fathead minnows, *Acid toxicants.

The feasibility of using histochemical and histopathological changes in brook trout, longnose dace and fathead minnows as bioindicators of acid pollution was investigated. Laboratory studies entailed using a gravity flow diluter system. Field studies involved using net traps in polluted streams. Exposure durations were 4-5 days and 28-30 days. Histochemical cytophotometric analyses were made of gills, Stannius corpuscle, blood, spleen, kidney and liver. The primary mode of acid toxicant action is gill damage which results in impaired respiratory, excretory and liver functions. Short term indices of acid stress include: colloidal iron and PAS staining of gills and renal Stannius corpuscles. A useful bioindicator of prolonged acid exposure is decreased azure B-RNA staining of liver cells; this assesses the extent of liver impairment and reflects of reduced tolerance of fish to other toxicants. Sublethal levels of acidity are not cumulative. However, pH levels of about 5.0 should be considered hazardous since they prove toxic to breeding fish having increased oxygen needs and also reduce the liver's ability to detoxify noxious substances present in acid polluted waters. (EPA)
W74-05113

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS.
Seattle Univ., Wash. Dept. of Civil Engineering.
Copy available from GPO Sup Doc as EP1.16:16070DCD09/70, $0.50; microfiche from NTIS as PB-228 263, $1.45. Environmental Protection Agency, Water Pollution Control Research Series, September 1970. 38 p, 11 fig, 6 tab, 15 ref. EPA Project 16070 DCD, Contract 14-12-481.

Descriptors: *Biochemical oxygen demand, *Bottom sediments, *Sludge, Sodium chloride, Salts, Light, Estuaries, Temperature, *Washington, Dissolved oxygen.
Identifiers: *Warburg respirometer, *Bellingham Bay(Wash), *Benthic sludge.

A laboratory study has been conducted to show the application of the Warburg respirometer in evaluating the influence of light, sodium chloride, dilution salts, temperature and agitation on the maximu oxygen uptake rate of disturbed bottom sediments. Experiments were conducted on estuarian benthic material obtained from Bellingham Bay, Washington. In all experiments the initial oxygen uptake rate was the maximum uptake rate. Results obtained using distilled water as the suspending medium were not appreciably altered due to the addition of BOD dilution salts, or sodium chloride in concentrations less than 30,000 mg/l. The initial uptake rate also appears to be insensitive to light. Ambient temperatures were varied from 10C to 20C and agitation settings were varied from instrument maximum to twenty-five percent of maximum. The Squalicum Creek sample showed variations in initial uptake from 2,000 to 57,000 mg/l of oxygen per hour. The Whatcom Creek sample had a range from 2800 to 83,000 mg/l of oxygen per hour. Results indicate that the maximum uptake rate is very sensitive to temperature, degree of disturbance, and the total volatile solids concentration of the benthic material. Agitation alone was shown to account for at least a ten fold increase in the maximum oxygen demand. (EPA)
W74-05114

ENVIRONMENTAL ACTIVITIES AND PROGRAMS AT THE SAVANNAH RIVER PLANT.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W74-05173

RADIONUCLIDES IN ECOSYSTEMS, VOLUME I.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W74-05182

RADIONUCLIDES IN THE ENVIRONMENT AT NUCLEAR POWER STATIONS,
Environmental Protection Agency, Cincinnati, Ohio. Radiochemistry and Nuclear Engineering Branch.
For primary bibliographic entry see Field 5B.
W74-05183

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05184

CESIUM-137 IN WHITE-TAILED DEER AS RELATED TO VEGETATION AND SOILS OF THE SOUTHEASTERN UNITED STATES,
Eastern Environmental Radiation Lab., Montgomery, Ala.
For primary bibliographic entry see Field 5B.
W74-05190

A PROPOSED MECHANISM FOR THE RECYCLING OF RADIOCESIUM IN FLORIDA SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-05192

PERSISTENCE OF RADIONUCLIDES IN SOIL, PLANTS, AND SMALL MAMMALS IN AREAS CONTAMINATED WITH RADIOACTIVE FALLOUT,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5B.
W74-05194

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
M. Merlini, F. Argentesi, A. Brazzelli, B. Oregioni, and A. Berg.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 285-306, (1971), 7 fig 7 tab, 24 ref.

Descriptors: Water pollution, Fish, Absorption *Zonc, *Toxicity, *Public health, *Radioactivity Food chains, Ecosystems, Lakes, Radioecology Biological properties, Path of pollutants Microbiology, Aquatic microbiology, Mercury Cadmium, Heavy metals, *Sunfishes.
Identifiers: *Italy(Lake Maggiore).

The biological pathway of Zn-65 was studied in th freshwater fish Lepomis gibbosus, L. from Lag Maggiore (Lake Maggiore) in Northern Italy unde different experimental conditions. The result showed that the biological half-times of accumula tion (Tba) and the rates of accumulation (k) o radiozinc from water by fish fed rations with 1 ppm of stable zinc and for fish fed a zinc-free die were significantly different. In the first case, th Tba was 97 days and k was equal to 0.007 per day whereas in the second case, for fish on a zinc-fre diet, the Tba was 27 days and the rate of accumu lation was 0.027 per day. Fish without stable zin in their diet accumulate their body burden at faster rate than those with zinc in their diet. In ad dition, fish fed zinc-free ration accumulated sig nificantly more radiozinc than those on a norma diet. Uptake data and bio-elimination half-time for Zn-65 absorbed from water by the fish ar given in detail. From the investigations performe it was ascertained that zinc, an essenti micronutrient, is homeostatically controlled b fish and that low levels of pollutants such as me cury and cadmium did not affect the total stabl Zn content of the animal within the time limits stu died. These metals do, however, inhibit the uptak of zinc as Zn-65 and the concentration of th nuclide. (See also W74-05181) (Houser-ORNL)
W74-05201

CYCLING OF ZINC-65 IN A SIMPLE FOO WEB,
Battelle-Pacific Northwest Labs., Richlan Wash. Ecosystems Dept.
C. E. Cushing, and D. G. Watson.
In: CONF-710501-P1 - Proceedings of the Thi National Symposium on Radioecology, May 1 12, 1971, Oak Ridge, Tenn. p 318-322, (1971), 4 fi 1 tab, 8 ref.

Descriptors: Cycles, *Zinc, *Water pollutio sources, Fish, *Carp, *Food webs, Research a development, Model studies, *Columbia Rive Radioactivity, Water pollution, Absorption, Me surement, Equilibrium, Retention.

Experiment was designed to investigate th cycling of Zn-65 in a simple water-periphyton-fi food web under constant flow, light, and ambie radionuclide concentration. Water temperatu followed the seasonal pattern of the Columb River. Replicate experimental streams containi periphyton and young carp (Cyprinus carpio) we spiked continuously to maintain Zn-65 concentr tions of approximately 1 and 10 pCi/ml - about and 200 times that of the river water. Periphyt and fish were sampled at intervals to ascertain t time necessary to reach equilibrium. Su sequently, the spike was cut off and retention the Zn-65 was followed. Concentrations of Zn- in periphyton approached equilibrium in about days at levels of 17 and 90 nCi/g wet weight in t low- and high-level streams respectively. The represent concentrations of about 23 and 150 tim that of the control periphyton and are very close the differential spike levels in the water. Th means that, under the conditions of this expe ment, periphyton concentrates Zn-65 in near direct proportion to ambient concentrations. T specific activity of the periphyton at equilibriu was 35 and 210 pCi/mg in the low- and high-lev streams respectively. The estimated effective ha life was about 15 days. Data on the fish were mo variable due to the influence of temperature metabolic rates. Approximate equilibrium w reached in about 43 days at concentrations of 0.

and 1.3 nCi/g wet weight in the low- and high-level streams respectively. This represents concentrations of 6 and 29 times that of the control fish. Specific activities at this time were 3 and 20 pCi/mg. These data suggest that true equilibrium in the carp had not been reached. Water temperatures varied from 6 to 18C during the experiment, which ran from January to June. (See also W74-05181) (Houser-ORNL)
W74-05202

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
I. L. Ophel, and C. D. Fraser.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 323-327, (1971) 1 fig, 4 tab, 11 ref.

Descriptors: *Cobalt, *Ecosystem, Freshwater, *Lakes, *Dystrophy, *Eutrophication, Water pollution, Water pollution effects, Assay, Measurement, Radioactivity, Aquatic plants, Fish, Biota, Absorption, Lake morphology, Distribution, Sediments.
Identifiers: *Canada(Perch Lake).

Perch Lake is a small dystrophic-eutrophic lake on the property of Atomic Energy of Canada Limited at Chalk River, Ontario. For seven years it has been receiving at a relatively constant rate small amounts of Co-60 via its inlet stream, resulting in low, but measurable, concentrations of this radionuclide in the lake water. During this time water and food-chain components have been assayed for Co-60 content using a large-volume counter combined with a single-channel gamma-ray spectrometer. Concentration factors were determined for the dominant species of aquatic plants, fish, and other biota. Large differences in accumulation were found between species of plants due to morphology of the plants and their location in the lake. Differences between fish species are correlated with their feeding habits. The vertical and horizontal distribution of radiocobalt in the bottom sediments was investigated. Most of the nuclide is confined to the upper few centimeters of the organic-rich deposits. Calculations indicate that the lake sediment is an important storehouse of cobalt and that approximately 30% of the Co-60 that has entered the lake is now resident on the bottom. (See also W74-05181) (Houser-ORNL)
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
S. A. Spigarelli.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 328-333, (1971) 2 fig, 4 tab, 19 ref.

Descriptors: *Cesium, *Fallout, *Ecology, Population, *Largemouth bass, Radioactivity, Absorption, Assay, Measurement, Compatibility, Lakes, Michigan, Speciation, Correlation analysis, *Michigan.
Identifiers: *Wintergreen Lake(Mich).

In order to better define the variable accumulations of Cs-137 fallout by the individuals of a fish population, the effects of selected ecological parameters were tested. Individual fish characteristics (sex and weight), monthly precipitation, and time of year were statistically analyzed for their influence on Cs-137 activities of largemouth bass collected from Wintergreen Lake, Kalamazoo County, Michigan. Monthly collections of bass were analyzed for Cs-137 activity. No significant difference in Cs-137 activity was detected between male and female bass of equal size. However, body weight was a significant factor; larger bass accumulated more Cs-137 and total Cs per unit weight than small bass. The plots of Cs-137 vs weight and total Cs vs weight were very similar and supported the specific activity concept. The relationship between weight and Cs-137 in bass was estimated to be curvilinear with positive slope up to approximately 1000 g and negative slope above 1100 g. Mean Cs-137 activities of bass collected monthly from May to October 1969 were significantly different. The maximum activities occurred during May, the minimum in August. No correlation was demonstrated between monthly precipitation levels and Cs-137 activities of bass. (See also W74-05181) (Houser-ORNL)
W74-05204

RELATIONSHIPS BETWEEN PHOSPHORUS-32 ACCUMULATION IN ALGAE, BACTERIA, AND TUBIFICIDS,
Western Michigan Univ., Kalamazoo. Dept. of Biology.
W. L. Stromberg, and C. J. Goodnight.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 410-416, (1971), 8 fig, 2 tab, 18 ref.

Descriptors: *Phosphorus, Kinetics, *Absorption, *Sorption, Retention, *Algae, *Bacteria, *Tubificids, Water pollution, Radioactivity, Radioactive tracer, Equilibrium, Worms, Ecology, Ecosystems.

Kinetics of accumulation and retention of P-32 were determined for unialgal cultures of Chlorella pyrenoidosa in carrier (52 mg Na2HPO4/liter) and carrier-free Knop's solution (modified) using 10 micron Ci P32/liter as tracer and a Geiger-Mueller counting system. Accumulation in a carrier-free solution was exponential and approached a 90% efficiency of removal within 30 min. In the carrier solution, accumulation was approximately linear and did not reach equilibrium within a 27-hr period. Using ouabain as an inhibitor, it was shown that the observed sorption of radiophosphate in carrier-free solution by this alga was independent of metabolic activity. Most loss of the phosphate taken up in a 27 -hr interval occurred within 1 hr in agitated carrier and carrier-free Knop's solution. Accumulation of P-32 by tubificid worms was also studied using similar counting methods. Uptake by these worms was approximately exponential in media with a bacterial source of radiophosphate, and was reduced by addition of chloramphenicol and removal of P-32 from solution by algae. Preliminary results indicated that C. pyrenoidosa competed effectively with the worms for inorganic phosphate, and that accumulation of P-32 by ingestion of algae among tubificids may be slight. Ecological implications of these results are discussed. (See also W74-05181) (Houser-ORNL)
W74-05206

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
D. W. Schults, and K. W. Malueg.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 417-424, (1971), 5 fig, 4 tab, 9 ref.

Descriptors: *Water pollution effects, *Lakes, *Radioisotopes, *Phosphorus, *Absorption, Ion exchange, Root system, Aquatic plants, Water, Sediments, Leaves, Silica, Sands, Transfer, Kinetics.
Identifiers: *Radiophosphorus, Sediment-water nutrient interchange.

Laboratory experiments were conducted to compare the uptake of phosphorus by roots and foliage of Elodea canadensis, Potamogeton amplifolius, and Vallisneria americana and to evaluate the cycling of radiophosphorus between the sediment and the water medium with the plant as the exchange agent. Intact plants were partitioned into root and foliage environments. For the comparison the radiophosphorus isotopes P-32 and P-33 were used simultaneously in the separate environments. Three different root media were evaluated for their influence on phosphorus uptake by the plants: lake water, silica sand saturated with lake water, and lake sediment saturated with lake water. All three species had higher uptake by the foliage than by the roots. For Potamogeton and Vallisneria, uptake by the foliage was greatest for plants rooted in sediment, less for those rooted in sand, and least for those rooted in lake water. For Elodea, uptake by the foliage was not statistically different for the three rooting media. For all experiments, except Vallisneria rooted in sand, there was a direct positive relationship between total uptake and percentage of radiophosphorus derived from the rooting medium. Only about 1% of the radiophosphorus in the foliage medium was transferred downward to the root medium. Up to 54% of the radiophosphorus added to the root medium was transferred through the plant and into the foliage medium. This process may constitute a significant sediment-water nutrient interchange mechanism in the littoral regions of lakes. (See also W74-05181) (Houser-ORNL)
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
A. Lerman, and H. Taniguchi.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 460-464, (1971), 1 fig, 5 tab, 14 ref.

Descriptors: *Fallout, *Strontium, *Cesium, *Lake sediments, *Great Lakes, *Radioactivity, Lake Ontario, Lake Superior, *Assay, Watersheds(Basins), Sedimentology, Deposition(Sediments), Lake Michigan, Lake Huron, Lake Erie, Transfer, Discharge, Movement, Precipitation(Atmospheric).

Input of Sr-90 into the Laurentian Great Lakes was estimated from the rates of deposition of nuclear fallout in atmospheric precipitation over the lake surface and land drainage basin of each lake, for the period 1954-69. The amount of Sr-90 accumulated in the sediments of Lakes Superior, Michigan, and Ontario is only a small fraction (2-6%) of the total amount introduced into the lakes. The amount of Cs-137 in sediment cores from Lakes Ontario and Superior is 20-35 times greater than the amount of Sr-90. These high concentrations of Cs-137, viewed against the value of 1.45 for the Cs-137/Sr-90 ratio in atmospheric fallout and 0.16-0.36 in the Great Lakes waters, indicate that Great Lakes sediments strongly control the concentration of Cs-137 in lake water. (See also W74-05181) (Houser-ORNL)
W74-05208

CHANGES IN MORPHOLOGICAL COMPOSITION OF THE BLOOD OF LARVAL FISH BITTEN BY WATER BUGS FAM. CORIXIDAE), (IN RUSSIAN),
L. D. Zhiteneva, and N. P. Sokol' skaya.
Vopr Ikhtiol. Vol 12, No 1, p 179-185. 1972. Illus.
Identifiers: *Corxidae, Erythrocyte, Fish morphology, Hemolysis, Larval fish, *Water bugs, Fish blood, *Corp, *Sterlet, Fish pathology, Fish parasites, *Fish poisons.

Blood changes in larvae of 3 different species of fish (pond carp, grass carp and sterlet) following a

bite by water bugs were investigated. The poison of these fish parasites produces a degradation of erythrocytes, and hemolysis. Pathological changes include changes in white blood cells, production of many immature lympho- and leukoblasts. These irreversible processes lead to death of the fish. The most sensitive to the bite are the sterlets.--Copyright 1973, Biological Abstracts, Inc.
W74-05209

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
Z. F. Short, P. R. Olson, R. F. Palumbo, J. R. Donaldson, and F. G. Lowman.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 474-485, (1971), 7 fig, 5 tab, 39 ref.

Descriptors: *Radioisotopes, *Molybdenum, *Lakes, Ecosystems, *Radioecology, *Washington, Crayfish, Periphyton, Aquatic environment, Food chains, Trout, Clams, Absorption, Transfer, Nutrient requirement.
Identifiers: *Fern Lake(Wash.).

The bioaccumulation of molybdenum, marked with Mo-99, was followed in month-long studies in an aquarium, where water, not food, was the major source of the nuclides, and in Fern Lake, where assimilation by organisms isolated in live-boxes was compared with assimilation by those with access to their usual sources of food. In the aquarium containing 3.3 ppm of the metal, the alga Nitella flexilis accumulated up to 130 ppm molybdenum, a 'luxury' amount. In Fern Lake, with 0.014 ppb, the maximum concentration in the N. flexilis was 8.8 ppb. Uptake in the lake was irregular because of local chemical conditions in the water. The concentration in periphyton from the lake shore-line reached 50 ppb. All the tissues dissected from clams, crayfish, and trout, in the aquarium contained some molybdenum. In trout the least amounts were in the gastrointestinal tract. In the lake, small amounts were in a few trout held without food in the live-boxes, but concentrations were upto 16 ppb in the gastrointestinal tract and liver of fish which were free to feed. The concentrations in the liver of fingerlings exceeded that in the yearlings by a factor of 4. (See also W74-05181) (Houser-ORNL)
W74-05210

EFFECT OF ORGANIC INSECTICIDES UPON CARBON-14 UPTAKE BY FRESHWATER PHYTOPLANKTON,
Florida Technological Univ., Orlando. Dept. of Biological Sciences.
D. H. Vickers, and C. E. Boyd.
In: CONF-710501-P1-Proceedings of the Third National Symposium on Radioecology, May 10-12, (1971), Oak Ridge, Tenn. p492-496, 1971, 4 fig, 1 tab, 8 ref.

Descriptors: *Organic pesticides, *Carbon radioisotopes, *Absorption, Freshwater, *Phytoplankton, Effects, Measurement, Bioassay, Chlorophyll, Ecosystems, *Water pollution effects, *Insecticides.

The effect of ten organic insecticides upon carbon dioxide fixation by phytoplankton was measured in situ by the C-14 bioassay technique. The following insecticides were tested individually at concentrations of 10 ppm: dieldrin, endrin, DDT, toxaphene, malathion, methyl parathion, mirex, sevin, metacil, and furadan. Only the carbamates (sevin, matacil, and furadan) and toxaphene consistently inhibited C-14 uptake under the test conditions. Further tests with the carbamates revealed that concentrations of 3 to 5 ppm of sevin and matacil resulted in about 50% reduction of C-14 uptake as compared with C-14 uptake by the control. Concentrations of 15 ppm of these two compounds almost completely inhibited C-14 uptake. A similar response curve was obtained for furadan, but C-14 uptake was reduced by only 60% at 15 ppm of this insecticide. The carbamate compounds greatly reduced concentrations of chlorophyll A in phytoplankton cultures within 24 hr. (See also W74-05181) (Houser-ORNL)
W74-05211

SOME ECOLOGICAL CONSIDERATIONS IN LOCATING A NUCLEAR-POWERED ELECTRICAL GENERATING FACILITY ON THE NORTH ANNA RIVER, VIRGINIA,
Virginia Commonwealth Univ., Richmond.
G. M. Simmons, Jr., and J. R. Reed, Jr.
In: CONF-710501-p1-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridg,e Tennessee. p 497-510, (1971) 15 fig, 5 tab, 10 ref.

Descriptors: *Water pollution effects, *Aquatic environment, Rivers, *Ecosystems, *Virginia, Nuclear powerplants, Lake impoundments, Reservoir storage, Reservoir releases, Direct benefits, Real benefits, Induced benefits, Ecology.
Identifiers: *North Anna River(Va.).

The North Anna River is a major tributary of the York River, which empties into the Chesapeake Bay. The ecological properties of a major portion of the North Anna River have been severely altered by more than 100 years of acid drainage from abandoned iron pyrite mines. Virginia Electric and Power Company is constructing a 13,000-acre impoundment within the disturbed area to provide cooling water for a 4,000,000-kW nuclear-powered electrical generating facility. Results from a preimpoundment study and inspection of the proposed reservoir construction and operation indicate that the facility will have a beneficial effect on the ecological properties of the lower North Anna River basin by accelerating the rate of recovery in the river below the dam. (See also W74-05181) (Houser-ORNL)
W74-05212

INFLUENCE OF WATER INTAKE ON THE DEGREE OF INCISOR FLUOROSIS AND ON THE INCORPORATION OF FLUORIDE INTO BONES AND INCISOR TEETH OF MICE,
Institute of Dental Research, Prague (Czechoslovakia).
J. A. Ruzicka, L. Mrklas, and K. Rokytova.
Caries Res. Vol 7, No 2, p 166-172, 1973. Illus.
Identifiers: Bones, *Caries, *Fluoride, *Fluorosis(Incisor), *Mice, Teeth, Tibial, Potable water.

Mice were given sodium fluoride solutions to drink in various concentrations and in various daily doses for a period of 200 days. At the end of experiment, both the fluoride content and the degree of fluorosis of the incisor teeth depended only on the concentration of fluoride in the administered solutions. The total daily fluoride intake was without effect. Both fluoride concentration in the drinking water and the total daily intake of fluoride produced effects in the tibia even after 220 days of experiment. This was caused by a great proportion of the bone which was not available to fluoride exchange while the unavailable bone conserved the state existing earlier. The importance of these results for dental caries prevention is discussed. The administration of fluoride in the form of fluoridated drinking water appears to be most advantageous.--Copyright 1973, Biological Abstracts, Inc.
W74-05246

ORGANOMERCURIALS IN THE ENVIRONMENT,
Glasgow Univ. (Scotland). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-05248

PCB RESIDUES IN PLANKTON FROM THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W74-05256

ISOLATION AND CHEMICAL IDENTIFICATION OF TOXIC COMPONENTS OF KRAFT MILL WASTES,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5A.
W74-05270

FOREST PRODUCTS POLLUTION CONTROL - ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
For primary bibliographic entry see Field 5B.
W74-05284

THE ULTRASTRUCTURE OF AN ALLOPARASITIC RED ALGA CHOREOCOLAX POLYSIPHONIAE,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
P. Kugrens, and J. A. West.
Phycologia, Vol 12, Nos 3/4, p 175-186, December 1973. 12 fig, 19 ref.

Descriptors: *Rhodophyta, *Parasitism.
Identifiers: *Ultrastructure, *Choreocolax polysiphoniae.

An alloparasite, Choreocolax polysiphoniae, apparently represents one of the most evolved parasitic red algae. Chloroplasts are highly reduced and consist of double membrane limited organelles lacking any internal thylakoid development. The uninucleate cells have thick walls, the absence of starch in cortical cells and large quantities of starch in medullary cells. Host-parasite concentrations are made by typical red algal pit connections. General effects of the infection on the host include cell hypertrophy, decrease in florideran starch granules, dispersed cytoplasmic matrices, and contorsion of chloroplasts. (Little-Battelle)
W74-05299

RESEARCH ON RED ALGAL PIGMENTS. THE EFFECT OF THE INTENSITY OF WHITE AND GREEN LIGHT ON THE RATE OF PHOTOSYNTHESIS AND ITS RELATIONSHIP TO PIGMENT COMPONENTS IN GRACILARIA COMPRESSA (C. AG.) GREV. (RHODOPHYCEAE, GIGARTINALES),
Bari Univ. (Italy). Inst. of Botany.
G. Calabrese, and G. P. Felicini.
Phycologia, Vol 12, Nos 3/4, p 195-199, December 1973. 1 fig, 2 tab, 22 ref.

Descriptors: *Rhodophyta, *Plant pigments, *Photosynthesis, *Light intensity, Chlorophyll, Respiration, Bioassay.
Identifiers: Gracilaria compressa, Green light, White light, Sunlight, Phycoerythrin, Carotenoids, Adriatic Sea, Sample preparation, Chlorophyll a, Carotene, Zeaxanthin, Lutein, Biliprotein.

The effects of green and white light at different intensities upon photosynthetic rates of Gracilaria compressa and their relationships to different pigment contents are reported. This is a typical rhodophycean alga, with adaptation to light intensity in the fronds of individual plants. In fact, the green distal portion which is exposed to direct sunlight (within a depth of a few meters), lacks phycoerythrin and shows a great proportion of carotenoids. The red proximal portion, which receives less light as a result of self-shading

synthesizes phycoerythrin and more chlorophyll. The photosynthetic activity in the two portions, assayed under different light conditions, indicates that the abundant oxygen output in the basal red part of the thallus, also at low light intensity, may be due to a high content of photosynthetic pigments. Conversely, the absence of phycoerythrin and lower chlorophyll content in the distal yellow-green part permits a reasonable photosynthetic rate only at higher light intensity. This is especially apparent in green light: at 250 lux no photosynthetic activity is to be seen in the yellow-green thallus, while the red portion reaches the compensation point. (Mortland-Battelle)
W74-05300

POLYCHLORINATED BIPHENYLS IN THE SEASTAR ACANTHASTER PLANCI,
Walla Walla Coll., College Place, Wash. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-05301

CONTRIBUTION TO THE GENERAL PATHOLOGY OF ENDOCARDIAL REACTIONS: TOXIC ENDOCARDIAL LESIONS IN LOWER VERTEBRATES (CARP), (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Max von Pettenkofer Institut.
D. Schulz.
Virchows Arch Abt A Pathol Anat. Vol 358, No 3, p 273-280, 1972, Illus. (English summary).
Identifiers: Bacteria, Cardial, *Carp, *Endocardial reactions, Exposure, Granuloma, Lesions, Vertebrates, *Toxicity, *Herbicides(Karmex) Fish pathology.

When carp were exposed to the herbicide Karmex (active ingradient 80% diuron) in laboratory conditions or in a pond they showed changes in the endothelial cells of the cardiac valves with concentrations of 0.1 ppm diuron or more. The endocardial changes ranged from slight to marked with numerous granulomas. The severity of histopathological findings depended on the concentration and time of exposure.--Copyright 1973, Biological Abstracts, Inc.
W74-05308

SPATIAL VARIABILITY OF THE PRODUCTIVITY: BIOMASS RATIO FOR PHYTOPLANKTON IN A SMALL MARINE BASIN,
Bedford Inst., Dartmouth (Nova Scotia).
T. Platt, and C. Filion.
Limnology and Oceanography, Vol 18, No 5, p 743-749, September 1973. 1 fig, 3 tab, 20 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Biomass, *On-site tests, Habitats, Homogeneity, Variability, Spatial distribution, *Canada, Water sampling, Sea water, Chlorophyll, Radioactivity techniques, Incubation, Statistical methods, Light, Photosynthesis.
Identifiers: Contemporaneous disequillibrium, Sample preparation, Dark bottle tests, Analysis of variance, Light bottle tests, Data interpretation, Errors, *Bedford basin(N.S.).

The productivity:biomass (P:B) ratio for phytoplankton was studied using a replicated sampling design at six stations in a small marine basin. On six out of ten sampling days, statistically significant differences were revealed in the P:B ratios between stations. This result is consistent with the concept of contemporaneous disequilibrium which emphasizes the spatial component of the heterogeneity of the phytoplankton habitat. The measurements were made in the Bedford Basin, Nova Scotia. Six sampling stations were used. On each of 10 sampling days, each station was visited and 15 liters of seawater collected from 5-m depth. The water from each station was stored in a separate carboy. When water had been gathered from all six stations, each carboy was shaken thoroughly and the following samples drawn off: six replicate 1-liter samples for chlorophyll analysis; six replicate light bottles and four replicate dark bottles for C-14-uptake measurement. All of the replicates for C-14-uptake measurement, a total of 60, were incubated at station 1 at 5-m depth. The in situ incubation of the C-14-uptake experiments lasted 4 hr. Chlorophyll was used as an index of phytoplankton biomass. An analysis of variance design permitted calculation of the standard errors of chlorophyll and C-14 uptake in the light and dark. Using these, the standard errors of the P:B ratios were calculated and compared between stations on the same day. (Mortland-Battelle)
W74-05316

BREEDING AND GROWTH OF THE CHAETOGNATH SAGITTA ELEGANS IN BEDFORD BASIN,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
A. Zo.
Limnology and Oceanography, Vol 18, No 5, p 750-756, September 1973. 5 fig, 2 tab, 20 ref.

Descriptors: *Breeding, *Growth rates, Worms, Sea water, Water sampling, Water temperature, *Canada, Reproduction, Secondary productivity, Respiration, Life cycles.
Identifiers: *Sagitta elegans, Chaetognaths, Sample preservation, Bedford Basin(N.S.), Macroinvertebrates.

This work was an attempt to examine a complete cycle of breeding and growth of Sagitta elegans Verrill, the only chaetognath found in Bedford Basin. Bedford Basin is an oval-shaped depression about 7 km long and 4 km wide with a maximum depth of 70 m. It is connected to the coastal water of Nova Scotia through a southeastern channel. A collection was taken every 2 weeks during daylight hours from 6 November 1967 to 21 February 1969 at a single station in the deepest part of Bedford Basin (depth 68 m, tidal range plus or minus 2 m). Samples were preserved immediately in an 8 percent Formalin-seawater solution. In the laboratory, counting, measuring, and stage separation were carried out under the microscope, usually on the day following collection. Within 1 year two generations of Sagitta elegans were found. The spring generation, reaching maturity of mid-September, reproduced during the remainder of the year. The autumn generation, consisting of the offspring of the spring generation, appeared to overwinter and established the spring adult population. The temperature-size relationship of S. elegans from Bedford Basin is in close agreement with McLaren's curve for this species in the eastern Canadian Arctic. Net carbon production rate, calculated from the spring generation, was highest in mid-September when the majority of the population approached maturity. (Mortland-Battelle)
W74-05317

DAPHNIA DISTRIBUTION WITHIN LANGMUIR CIRCULATIONS,
Freshwater Biological Association, Windermere (England).
D. G. George, and R. W. Edwards.
Limnology and Oceanography, Vol 18, No 5, p 798-800, September 1973. 2 fig, 9 ref.

Descriptors: *Daphnia, *Distribution patterns, Light intensity, Winds, Reservoirs, Sampling, *Eutrophication, Water pollution effects.
Identifiers: *Langmuir circulations, Daphnia hyalina, Foamlines, Macroinvertebrates, Vertical distribution.

Crustacean zooplankton distribution was studied in Eglwys Nynydd, a eutrophic reservoir near Port Talbot, S. Wales. The reservoir is exposed to the prevailing winds blowing in from the sea and never stratifies thermally. Daphnia hyalina var. lacustris (Sars) dominates the zooplankton, both numerically and in terms of biomass, throughout the year. Studies of the vertical distribution of the species collected over 2 years have shown that the animals tend to avoid the surface waters in daylight. Continuous horizontal samples of zooplankton were taken with a self-priming pump (30 liters/min capacity) connected to a sectional intake boom installed on a small boat. When used to examine distributions within Langmuir spirals the intake boom was positioned just below the surface (10-30 cm) and run first along, and then midway between, well-defined foamlines. Water was pumped directly into 2-liter containers in the boat for subsequent filtration on shore and all the Daphnia in each sample were counted. Daphnia hyalina was concentrated near the surface midway between the foamlines of Langmuir circulations that developed in a shallow reservoir at wind speeds above 400 cm/sec. Such concentration was probably caused by the antagonistic factors of upward water transport carrying D. hyalina to the surface zone and oriented movements away from this region of high light intensity. (Mortland-Battelle)
W74-05318

MICROCULTURES OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) CELLS: THEIR USE IN QUANTITATION OF CHANNEL CATFISH (ICTALURUS PUNCTATUS) VIRUS AND ANTIBODY,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5A.
W74-05323

EFFECTS OF RED MUD ON MARINE ANIMALS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
R. A. A. Blackman, and K. W. Wilson.
Marine Pollution Bulletin, Vol 4, No 11, p 169-171, November 1973. 1 tab, 7 ref.

Descriptors: *Toxicity, *Waste disposal, *Marine fish, *Clams, *Shrimp, *Oysters, Bioassay, Water pollution effects, Industrial wastes, Mortality.
Identifiers: *Red mud, Scrobicularia plana, Cardium edule, Solea solea, Mytilus edulis, Crangon crangon, Agonus cataphractus, Germany, United Kingdom, North Sea, Bristol Channel.

Red mud, which is a waste product from the reduction of bauxite in the production of aluminum, has been disposed of in Bristol Channel by the UK with no apparent harmful effects. However, in considering the North Sea as a potential dump for red mud, Germany concluded that such disposal would be inadvisable because of detrimental effects on fauna. To determine whether the difference in results occurred from differences in chemical or physical characteristics of the red muds, bioassays were conducted with red muds from the UK and Germany. Red muds contain various quantities of Fe_2O_3, Al_2O_3, SiO_2, Na_2O, CaO, TiO_2, and ash. The experimental solutions were prepared from settled solids; the UK material had about 26 percent solids and the German 55 percent. The experiments were of two types: exposure to red mud settled on a substrate or red mud maintained in suspension. Scrobicularia plana, a deposit-feeding bivalve, Cardium edule, a suspension-feeding bivalve, and Solea solea, a bottom-living flatfish, were exposed to the deposits (5.0-50 mg/sq cm). Mytilus edulis, Crangon crangon (brown shrimp), and Agonus cataphractus (armed bullhead) were exposed to the suspension (up to 33 g/l). All organisms seemed to be unaffected by red mud except the armed bullhead. At 33 g/l, all bullheads died within 72 hr. No mortality occurred in 72 hr with 3.3 g/l red mud. On the evidence of the comparative studies it is concluded that the differences in origin and treatment of bauxite result in red muds of only slightly different toxicities. The physical and

chemical characteristics of the waste and its observed effects on plants and animals in the laboratory are important considerations, but they must be related to the hydrographic and biotic features of the proposed disposal site, to the quantities involved and to the method of disposal. (Little-Battelle)
W74-05325

PARAFFIN HYDROCARBON PATTERNS IN PETROLEUM-POLLUTED MUSSELS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5A.
W74-05326

STUDY OF METABOLIC REGULATIONS BETWEEN CYANOPHYCEAE AND FISH (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. Ya. Malyarevskaya, T. I. Birger, O. M. Arsan, and V. D. Solomatina.
Gidrobiol Zh, Vol 8, No 3, p 47-55, 1972, Illus, English summary.
Identifiers: *Cyanophyceae, *Fish metabolism, Microcystis-aeruginosa, Nitrogen, Oxygen, *Toxicity, Hydrochemical regime.

The problems of the effect of Cyanophyceae (Microcystis aeruginosa) on fish were studied. Changes in the hydrochemical regime in the fish environment under effect of Cyanophyceae, changes in the O2 consumption intensity, N metabolism, biochemical composition of fish under different Cyanophyceae concentrations in environment are shown. Some mechanisms of the toxic effect on fish are detected.--Copyright 1973, Biological Abstracts, Inc.
W74-05327

PHILOMETRA NODULOSA IN WYOMING WHITE SUCKERS,
Wyoming Game and Fish Commission, Casper.
T. J. Clifford, and S. Facciani.
Prog Fish-Cult, Vol 34, No 4, p 235-236, 1972, Illus.
Identifiers: *Copepod, Philometra-nodulosa, *White suckers, *Wyoming(Ocean Lake), *Water temperature, *Nematodes.

A severe infection by the nematode P. nodulosa was observed in the fins of the white sucker population of Ocean Lake, Wyoming. Information on the infection rate, migration date, and midlake water temperature was collected. Water temperature appeared to be the principal factor governing migration of the female nematode from the fins of the fish. Only the female P. nodulosa is infective in the fins, 'cheek galleries,' and gular areas of fish and subsequently migrates from the fishes body to release larvae from its enlarged uterus. The larvae are ingested by copepods which are in turn ingested by fish where they become reinfective as adults.--Copyright 1973, Biological Abstracts, Inc.
W74-05329

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, and R. R. Stickney.
Available from NTIS, Springfield, Va 22151 AD-757 717 Price $6.00 printed copy; $1.45 microfiche.
Contract Report, April 1972. 373 p, 141 fig, 60 tab, 16 ref. Army Corps of Engineers Contract DACW 21-71-0020.

Descriptors: *Dredging, *Environmental effects, *Salt marshes, Wetlands, Spoil banks, Water pollution effects, Silting.

The environmental response to the deposition of dredged material on salt marshes was studied in diked and undiked confinements. Studies of water quality changes, studies of salt marsh sediment responses, and biological studies were directed toward identifying any changes in the biota in areas of dredging activities. In natural and relatively unpolluted areas, dredging has no significant effect on water quality where diked or undiked techniques are used. In polluted areas in marine environments, water quality impairment is caused by dredging activities. The time that the water with the dredge material is allowed to stay in the spoil area may greatly influence the quality of the effluent from the spoil area. The depth of spoil material deposited on the salt marshes will greatly affect the time of reequilibration of the salt marsh vegetation to its original configuration. No effects of dredging on the fishes and macroinvertebrate fauna within the 1971 dredged areas along the Intracoastal Waterway of Georgia could be defined. Seasonal patterns between experimental and control stations showed no deviations outside of apparent normal ones. In addition, samples obtained immediately prior to, during, and after dredging showed no patterns which could specifically be assigned to effects of dredging. (Knapp-USGS)
W74-05332

MEASURING IMPACTS OF WATER RESOURCE DEVELOPMENTS ON THE HUMAN ENVIRONMENT,
Battelle-Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 6G.
W74-05338

IN VITRO INTERACTIONS OF FUSARIUM AND VERTICILLIUM WILT FUNGI WITH WATER, PH AND TEMPERATURE,
For primary bibliographic entry see Field 3F.
W74-05341

THE NONPARASITIC DISEASES. IMMISSION DAMAGE (GAS, SMOKE AND DUST DAMAGE). WASTE WATER DAMAGE INCLUDING DAMAGE CAUSED BY SOLID WASTES,.
Paul Parey: Berlin, West Germany. 1970. 227 p. Illus.
Identifiers: Books, Dust, Fluorides, Gas, *Immission damage, Lime, Metals, Nitrates, Nitrites, Nonparastic diseases, Smog, Smoke, Solid wastes, *Air pollution effects, *Water pollution effects, *Bibliographies.

Aspects of protection for a wide range of plants, especially cultivated plants, against immissions are discussed. Immissions include SO2, fluoride compounds, ammonia, H2S, nitrous gases, H2SO4, chromic acid, smog and peroxyacetyl nitrate, nitrite, lime, alkali, basalt, metal, arsenic and grain dusts, and ashes. The damage to the plants, their mode of effect, plant resistance and determination of these immissions in the atmosphere are discussed. The effect of waste water and solid wastes on plants and soil, the fertilizer value of some household and industrial wastewater and damage caused by alkali salts, trace elements, organic substances, detergents, radioisotopes, compost, sewage sludge, mineral oil products and solid industrial wastes are also discussed. An extensive bibliography is included at the end of each section.--Copyright 1973, Biological Abstracts, Inc.
W74-05342

BIONOMICS OF CYCLOPS STRENUUS ABYSSORM SARS (COPEPODA:CYCLOPOIDA),
Freshwater Biological Association, Ambleside (England).
W. J. P. Smyly.
Oecologia (Berl). Vol 11, No 2, p 163-186. 1973. Illus.
Identifiers: Biomass, *Bionomics, *Copepoda, Cyclopoida, Cyclops-Strenuus-Abyssorum, Dissolved oxygen, Fecundity, Lakes, Production, Sewage, Water pollution effects, *English Lake District.

The annual cycle of C. strenuus abyssorum in some lakes of the English Lake District is described. Esthwaite Water, Rydal Water and Grasmere, all enriched by sewage, and Buttermere, a relatively unproductive lake, were sampled most frequently. There is only 1 effective generation in the year in each of these lakes. Individuals hatch from eggs laid in the spring. In the deepest of the 4 lakes (Buttermere), these individuals reach the adult stage in early winter, pass the winter in the planktonic zone and start laying eggs early in the following year. In the other 3 lakes, most individuals of the spring generation reach the 5th copepodid stage by mid-summer and then spend the next 8 mo. in the profundal zone. They leave this zone in Feb. or March to return to the planktonic zone, become adult and start breeding. In July a few individuals may mature in the planktonic zone. A correlation between the time in mid-summer when stage V copepodids appear in the profundal zone of the 3 shallower lakes and amounts of dissolved O2 in this zone is shown. Although a correlation of this kind is plausible, presence of stage V copepodids in a deep, well oxygenated lake (Tirlmere) suggests that a casual connection of this kind is too simple an explanation. Rates of development of the different instars were experimentally at constant temperatures and used to estimate production. Production, biomass and fecundity were all higher in Esthwaite Water than in the other 3 lakes.--Copyright 1973, Biological Abstracts, Inc.
W74-05344

EFFECT OF TRACE ELEMENTS ON THE WATER REGIMEN, THE DECORATIVE QUALITIES AND THE SEED YIELD OF SOME ORNAMENTAL PLANTS, (IN RUSSIAN),
Kishinev Botanical Garden (USSR).
K. I. Andon.
Agrokhimiya. 3, p 107-111. 1972.
Identifiers: *Boron, Decorative qualities, *Manganese, Ornamental plants, *Petunia plants, Seeds, *Trace elements, Yield, *Zinc.

Supplemental, foliar application of B, Mn and Zn improves the water regimen and increases the ornamental quality, seed production and fragrance of hybrid petunia plants.--Copyright 1973, Biological Abstracts, Inc.
W74-05345

LOW PH LEVELS WIPE OUT SALMON AND TROUT POPULATIONS IN SOUTHERNMOST NORWAY,
K. W. Jensen, and E. Snekvik.
Ambio, Vol 1, No 6, p 223-225, 1972, Illus.
Identifiers: *Norway, Fish populations, *Salmon, *Trout, *Hydrogen ion concentration, Fish hatching, Fish mortality.

Low pH levels in rivers of southern Norway have resulted in the mortality of trout and salmon. Experiments show that the lower pH limits for normal hatching and fry development are pH 5.0-5.5 for salmon, 4.5-5.0 for sea trout and ca pH 4.5 for brown trout. An examination of the relation between pH values in the rivers and lakes in question and salmon and trout populations shows that these fish populations generally decrease in size as the pH level decreases.--Copyright 1973, Biological Abstracts, Inc.
W74-05356

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
M. Bisiach.

Riv Patol Veg, Vol 8, No 2, p 159-181, 1972, Illus, English summary.
Identifiers: *Algae control, *Algicides, Benzuride, Captafol, Chloroacetamido-3, Folpet, Hydrodictyon-reticulatum, Laboratory tests, *Naphthoquinone derivatives, Oedogonium, Potassium permanganate, *Rice fields, Spirogyra, Tests.

Benzuride, Captafol, HOE 2997, Folpet and KMnO4 at 0.5, 1, 2, 4 and 8 ppm were tested against Spirogyra sp., Oedogonium sp. and Hydrodictyon reticulatum. Rice seedlings are often killed by suffocation caused by algal scum. All the chemicals except Benzuride showed marked algicidal activity. HOE 2997 (2,dichloroacetamido-3,chloro,1,4naphthoquinone) has a complete algicidal activity at 1 ppm against Oedogonium sp. and H. reticulatum and at 2-4 ppm against Spirogyra. The naphthoquinone derivative was not phytotoxic for rice, and is recommended for the control of algae in rice fields.--Copyright 1973, Biological Abstracts, Inc.
W74-05357

DISTRIBUTION AND EPIZOOTIOLOGICAL IMPORTANCE OF DACTYLOGYRUS EXTENSUS (MONOGENOIDEA) IN SLOVAKIA (IN CZECH),
R. Zitnan.
Helminthologia (Bratisl). 11. p 141-146, 1970, English summary.
Identifiers: *Carp, *Czechoslovakia(Slovakia), *Dactylogyrus-extensus, Distribution, Epizootiological studies, *Monogenoidea.

Carps (1350) were examined in Slovakia (CSSR) in 54 localities of different water types during 1957-1969. D. extensus was found in all localities, its total distribution rate being 82.9% with a frequency rate of 1-246 specimens. The importance of D. extensus in early spring at a water temperature below 10C when young carp may be seriously endangered in hibernation ponds is indicated.--Copyright 1973, Biological Abstracts, Inc.
W74-05358

ON THE PROBLEM OF HOST SPECIFICITY, RESERVOIR PARASITISM AND SECONDARY INVASIONS OF CAMALLANUS LACUSTRIS (NEMATODA:CAMALLANIDAE), (IN CZECH),
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
F. Moravec.
Helminthologia (Bratisl). 10. p 107-114, 1969(1971), Illus.
Identifiers: Camallanidae, *Camallanus-lacustris, *Cyprinid, *Fish parasites, Host specificity, *Nematoda, *Perch, Reservoirs, *Salmonoid.

C. lacustris parasitizes mainly perch but can often be found in representatives of other families, e.g. Cyprinid and salmonoid fishes. Secondary invasions by adult parasitic worms from the original host to a new host fish are possible. The possibility of an atypical location of C. lacustris larvae in the host was investigated and no larvae were found in atypical locations.--Copyright 1973, Biological Abstracts, Inc.
W74-05359

COMPARATIVE STUDY OF THE EFFECT OF SOME ANION ACTIVE DETERGENTS ON THE REPRODUCTION OF LISTERIA MONOCYTOGENES AND OTHER BACTERIA,
I. Durst, J. Palicska, and A. Sawinsky.
Z Gesamte Hyg Grenzgeb, Vol 18, No 8, p 618-621, 1972, Illus.
Identifiers: Bacteria, *Bactericidal agents, *Detergents(Anion active), Escherichia-coli, *Listeria-monocytogenes, Pseudomonas-aeruginosa, Reproduction, Waste water.

The effects of Na dodecyl benzenesulfonate (DBS) and Na lauryl sulfate (LS) in concentrations up to 10000 microgram/ml on growth of L. monocytogenes, Pseudomonas aeruginosa and Escherichia coli cultures showed that at the doses used, both detergents had a bactericidal effect on L. monocytogenes. P. aeruginosa and E. coli were much less sensitive to the detergents. The intensity of the effect of the detergents was dependent on the substances in which they were dissolved; the bactericidal effect of DBS was higher in water and NaCl and the effect of LS was higher in meat broth boullion. Since only very high detergent concentrations have very high bactericidal effects in waste water, L. monocytogenes could occur in these waters. The occurrence of L. monocytogenes in surface waters is less probable, since lower detergent concentrations have a bactericidal effect.--Copyright 1973, Biological Abstracts, Inc.
W74-05360

TOXICITY OF SOD PODZOLIC SOILS LYSIMETRIC SOLUTIONS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05375

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5B.
W74-05393

5D. Waste Treatment Processes

REMOVAL OF HEAVY METALS FROM MINE DRAINAGE BY PRECIPITATION,
Denver Univ., Colo. Dept. of Chemical Engineering and Metallurgy.
L. W. Ross.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-080, $1.00; microfiche from NTIS as PB-228 584 $1.45. Environmental Protection Agency Technology Series report EPA-670/2-73-080, September 1973. 64 p, 22 fig, 1 tab, 14 ref. EPA Project 14040 FZC.

Descriptors: *Mine drainage, Metals, Sulfides, *Neutralization, *Heavy metals, Chemical precipitation, *Waste water treatment, Colorado, Rocky mountain region, Computer programs, *Recycling, Costs, *Mine wastes.
Identifiers: San Juan Mountains, *Sulfide treatment, *Recovery(Mine wastes).

Heavy metals in mine drainage waters of the Rocky Mountains can be removed by a two-stage process consisting of (1) neutralization followed by (2) sulfide treatment. The first stage removes ferric and aluminum hydroxides, and the second (sulfide) stage precipitates the heavy metals that are most objectionable as pollutants, and that are of possible interest for economic recovery. The two-stage process has been demonstrated in the laboratory and in a field experiment. In the field, powdered lime was employed for neutralization, and barium sulfide was employed as sulfide source in a two-stage treatment tank. The ferric and aluminum hydroxides failed to settle when the slightest winds disturbed the surface of the settling pond, but the sulfides settled within a few feet downstream. The measured pH of treated streams has proven entirely satisfactory for control of chemical additions. A computer program based on published values of equilibrium constants and solubility-product constants is capable of adequate prediction of the required chemical quantities for treatment, and of the resulting metal concentrations in solution. The economics of chemical addition indicates that recovery of sulfides (CuS, ZnS) for sale to smelters can partially offset the cost of treatment, but never completely. (EPA)
W74-04851

DYNAMIC BEHAVIOR OF A COMPLETE-MIXING ACTIVATED SLUDGE SYSTEM,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
G. C. Y. Chu, L. E. Erickson, and L. T. Fan.
Biotechnology and Bioengineering, Vol 15, p 1101-1121, November 1973. 13 fig, 2 tab, 23 ref.

Descriptors: *Activated sludge, *Biological treatment, *Waste water treatment, Flow rates, Chemical oxygen demand, *Aeration, Organic matter, Cultures, Gravimetric analysis, Recycling, *Sludge treatment.
Identifiers: Wasting rates, Continuous cultures, Adenosine triphosphate, Dry weight.

The dynamic behavior of a laboratory-scale activated sludge biological waste treatment process with recycle and wasting of sludge was investigated by subjecting the system to step changes in the influent waste concentration, the recycle flow rate, or the sludge wasting rate. The dynamic behavior of the system was examined by measuring adenosine triphosphate (ATP) in addition to dissolved chemical oxygen demand (COD) and cell dry weight in the aeration tank. Cell dry weight of the recycle flow and effluent COD were also measured. System performance changed appreciably when the system was subjected to step changes in the influent waste concentration, the recycle flow rate, or the sludge wasting rate. Generally, the responses to a step increase and a step decrease of the same input variable were not symmetrical, especially in the response of the ATP concentration. The ATP/MLSS ratio was found to depend on the food-to-organism ratio in the aeration tank. When this ratio was small, the ATP/MLSS was large. The time constant analysis showed that the dry weight time constants were directly related to the sludge mean residence time; as the sludge wasting rate increased, the value of the time constant decreased. The time constants of the dissolved COD variation in the aeration tank were much smaller than those of the sludge dynamics. The dissolved COD time constants were found to be closely related to the fluid mean residence time in the aeration tank. (Mortland-Battelle)
W74-04900

POPULATION CHANGES IN ENTERIC BACTERIA AND OTHER MICROORGANISMS DURING AEROBIC THERMOPHILIC WINDROW COMPOSTING,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
J. Savage, T. Chase, Jr., and J. D. Macmillan.
Applied Microbiology, Vol 26, No 6, p 969-974, December 1973. 9 fig, 2 tab, 13 ref.

Descriptors: *Enteric bacteria, *Farm wastes, *Hogs, *Aerobic conditions, Waste treatment, Temperature, Hydrogen ion concentration, Oxidation-reduction potential, Environmental effects, Salmonella, Temperature, Sampling, Methodology, Decomposing organic matter.
Identifiers: Survival, *Composting(Windrow), Bacterial populations, *Thermophilic conditions, Fecal streptococci, Cellulolytic microorganisms, Fecal coliforms, Mesophilic microorganisms, Enterococci, Actinomycetes, Culture media, Selective media, Biochemical tests, Mesophilic bacteria, Mesophilic fungi.

Composting of wastes from swine feeding operations was studied. The effects of the frequency of turning the wastes and addition of straw to improve the physical structure was studied to determine the most effective technique to rapidly increase the temperature and, consequently, destroy coliforms and Salmonella. Four different treatments were studied; the results showed that, with addition of 5 percent (wt-wt) straw and mechanical turning of the compost 20 times per week, the temperature reached 60C within 3 days and enteric bacteria were destroyed within 14 days. The possibility of survival of pathogens at the cool surface

of a windrow operation, however, has not been disproven. The results indicate a marked decrease in coliforms, salmonellae, and enterococci during the thermophilic stage of composting. For maximal sanitary safety, the thermophilic stage of composting should be reached as soon as possible. A succession of microbial populations was observed during the composting process. The bacteria increased in number before the temperature of the windrows rose and then declined, whereas cellulolytic organisms and actinomycetes in general increased in the thermophilic stage. Presumably, the mesophilic bacteria rapidly attack the more readily available organic constituents, resulting in a temperature increase. The increased temperature favors the cellulolytic organisms, and the mesophilic bacteria largely disappear. The actinomycetes appeared in the final stage to such an extent that the surfaces of the compost piles were white or gray. These organisms are known to play a role in the humification of organic matter, which results in a stabilized product. (Holoman-Battelle)
W74-04908

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
E. J. Ciolkosz, L. T. Kardos, and W. F. Beers, Jr.
Available from the National Technical Information Service as PB-228 868, $10.25 in paper copy, $1.45 in microfiche. Pennsylvania State University Institute for Research on Land and Water Resources, Technical Completion Report, December 1973. 135 p, 24 fig, 30 tab, 38 ref, 1 append. OWRR A-027-PA(1). 14-31-0001-4038.

Descriptors: *Acid Mine Water, Percolation, Acidity, *Iron, *Conductivity, *Soil properties, Silt loam, Clay loam, Cation exchange, Water quality, Calcium carbonate, *Pennsylvania, *Hydrogen ion concentration, *Waste water treatment, Water pollution control.
Identifiers: Rayne silt loam, Guernsey silty clay loam, Soil pH, Renovation, Equilibration.

Equilibration of soil material from three horizons (Ap, B23 and Cl) at various ratios (1:1, 1:5 and 1:50) of soil to acid mine drainage water (AMW) indicated that maximum effect on pH, total acidity, conductivity, and iron content of the AMW occurred within five minutes and in the narrowest soil:AMW ratio. At 32 hours pH was increased from 3.1 to 6.6 with the Ap horizon material in the 1:1 ratio. The more acidic B23 and Cl horizons increased the pH one unit. Total acidity decreased 85%, 65% and 45% with the Ap, B23 and Cl materials, respectively. Conductivity decreased about 5 to 10%. Total iron content in the 1:1 system was decreased from 250-330 mg/l to a trace with all three soil materials. Percolation of AMW through reconstructed 40-inch soil profiles of Rayne silt loam and Guernsey silty clay loam at a loading rate of 5 inches at weekly intervals for 20 weeks increased pH of the AMW from 2.6-2.8 to 4.0 with the Rayne soil and to 8.0 with the calcareous Guernsey soil. Total acidity was decreased 75% with the Rayne soil while the Guernsey soil produced an alkaline column effluent. Iron was totally removed by both soils. Al was decreased 50% by the Rayne soil. The Guernsey soil totally removed Al, Zn, Cu, and Mn. Conductivity was decreased 16% by the Rayne and 11% by the Guernsey. Twenty-one soil samples (horizons) from seven Pennsylvania soils were equilibrated for 32 hours three times in succession in a 1:5 soil:AMW ratio. Multiple linear regression analysis was used to evaluate the effect of certain soil properties on the chemical quality of the equilibrated AMW. Most of the variation of pH, total acidity and iron was accounted for by cation exchange capacity and CaCO3 equivalent.
W74-04981

ECOLOGY OF DAPHNIA IN STABILIZATION PONDS,
Texas State Dept. of Health, Austin. Div. of Wastewater Technology and Surveillance.
R. Dinges.
Report 1973. 41 fig, 14 tab, 69 ref, appendix.

Descriptors: *Waste water treatment, *Daphnia, *Oxydation lagoons, *Biological treatment, Texas, Photoperiodism, Life cycles, Ammonia, Toxicity, Sulfides, Hydrogen ion concentration, Depth, Marketing, Design, Water quality, Bibliographies, Effluents, Crustaceans, Water purification, Algae, Rotifers, Dissolved oxygen, Hatching, Predation, Pilot plants.
Identifiers: *Daphnia similis, Daphnia pulex, Moina, Lemna.

It was observed that the presence of Daphnia resulted in clarified wastewater stabilization pond effluent in a few (6%) Texas locations. This investigation focused on the suitable environmental conditions for Daphnia and Moina. The two Daphnia species, D. similis and D. pulex, were only present in extra deep ponds. The manner in which Daphnia serves to stabilize and clarify water could include digestion processes, by incorporation of organics into biomass, and some material is rendered inert by conversion into chitin, the material of which Daphnia shells are composed. A limited market for Daphnia exists, but would quickly be satisfied should mass culture in wastewater prove feasible and offers a real possibility of gaining significant financial returns from a wastewater resource. A pilot plant operation indicated that successful operation required provision of adequate mixing-aeration to supply the respiratory needs and associated organisms and to preclude evolution of soluble sulfides from benthic deposits and to control pH within a range of 7.0 - 7.5. Daphnia culture (which is described) may be feasible to further improve effluents from secondary wastewater treatment plants due to its feeding habits on algae and other suspended organic material. Its life cycle and a pertinent literature review are included. (Auen-Wisconsin)
W74-05048

AIR FLOTATION-BIOLOGICAL OXIDATION OF SYNTHETIC RUBBER AND LATEX WASTE-WATER,
Firestone Synthetic Rubber and Latex Co., Lake Charles, La.
A. H. King, J. Ogea, and J. W. Sutton.
Copy available from GPO Sup Doc as EP1.23:660/2-73-018; $1.60; microfiche from NTIS as PB-229 408 $1.45. Environmental Protection Agency, Technology Series Report, EPA-660/2-73-018, November 1973. 136 p, 21 fig, 20 tab, 14 ref. EPA Project 12110 GLP.

Descriptors: *Waste water treatment, Industrial wastes, Treatment facilities, *Synthetic rubber, *Louisiana, *Coagulation, Flocculation, *Flotation, *Biological treatment, Aerated lagoons, *Oxidation, Biochemical oxygen demand, Pilot plants, Construction costs, Operating costs, Design data.
Identifiers: Lake Charles(La).

The operation of a secondary waste-water treatment facility for treatment of the combined wastewater from Firestone's Lake Charles, Louisiana synthetic rubber manufacturing plant was studied for a period of nine months. The waste-water treatment facility was designed to treat an average daily flow of 3.4 mgd and a BOD load of approximately 2,000 lbs/day. The report describes the laboratory and pilot studies that were performed during the process development phase of the project and presents design data, operational data, and treatment cost data for the full scale facility. The effluent BOD concentration averaged 11.5 mg/l, with a suspended solids content of 29 mg/l. The BOD removal rate coefficient averaged .067 mg/l/day with an average BOD loading rate of .548 lbs BOD/day/lb MLSS. Capital costs including construction for the treatment facility were $1,472,528. Operational, maintenance, and depreciation costs were $.499/1,000 gals. of raw waste-water treated, excluding sludge disposal costs. (EPA)
W74-05105

INTERSTATE PLANNING FOR REGIONAL WATER SUPPLY AND POLLUTION CONTROL.
Weston (Roy F.), Inc., West Chester, Pa.
Copy available from GPO Sup Doc as EP1.16:16110FPP 11/71, $3.00; microfiche from NTIS as PB-229 573 $1.45. Water Pollution Control Research Series, Environmental Protection Agency, November 1971. 206 p. EPA Project 16110 FPP.

Descriptors: *Planning, *River Basin development, *Pollution abatement, Optimum development plans, *Regional analysis, *Interstate Commissions, *Water supply, Land use, *Alternative planning, Waste disposal, *Waste water treatment, Sewage treatment, Projections, Human population, Water demand.
Identifiers: Waste treatment regionalization, *Delaware River(Tock's Island region).

This report, prepared for Delaware River Basin Commission presents the results of a study of the problem of water supply and waste disposal in the three-State, six-county region in which the Tocks Island Reservoir and the Delaware Water Gap National Recreation Area are being developed. Peak summer populations are projected over a 50-year period and utilities systems alternatives which could accommodate such projected growth are presented. Water supplies in the region are seen as adequate to meet future demands, with heavy emphasis on development of groundwater resources. Five alternative sewerage plans, ranging in degree of regionalization from 116 local treatment systems to a single system for the entire region, are outlined including detailed cost estimates. Preservation of water quality in the region is a primary objective of the study. (EPA)
W74-05108

TREATMENT OF LAUNDROMAT WASTES,
Rensselaer Polytechnic Inst., Troy, N.Y.
D. B. Aulenbach, P. C. Town, and M. Chilson.
Copy available from GPO Sup Doc as EP1.23/2:73-108, $0.95; microfiche from NTIS as PB-227 369 $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-108, February 1973. 65 p, 18 fig, 20 tab, 10 ref. EPA Project 12120 DOD.

Descriptors: *Waste water treatment, *Recycling, *Filtration, *Ion exchange, Chemical precipitation, Effluents, Industrial wastes, Detergents, *Biochemical oxygen demand, *Chemical oxygen demand, *Alkylbenzene sulfonates.
Identifiers: Alum treatment.

Laboratory and field studies were conducted to evaluate the laundromat waste treatment capabilities and the effluent recycling possibilities of two systems. The Winfair Water Reclamation System (WWRS) involves the addition of alum at a pH of 4, sand filtration, and passage through an ion exchange resin. The American Laundry Machinery Industries (ALMI) Diatomaceous Earth Filtration System employs chemical precipitation prior to filtration. The WWRS resulted in a 61% BOD reduction, 71% COD reduction, 94% ABS reduction, and a buildup of total solids in the effluent. The system produced an effluent suitable for discharge into many streams. For effluent recycling, a functioning demineralizer would be required. The ALMI System achieved a 70% BOD reduction, 84% COD reduction, 98% ABS reduction, 94% PO4 reduction, and complete coliform removal. The increase in effluent alkalinity and hardness render very questionable the suitability of effluent reuse without softening and pH adjustment. The introduction of the system into existent

aundromats would increase the cost of washes by bout 10 cents. (EPA)
W74-05109

KRAFT PULPING EFFLUENT TREATMENT AND REUSE - STATE OF THE ART,
Saint Regis Paper Co., Pensacola, Fla. Research nd Development Center.
V. G. Timpe, E. Lang, and R. L. Miller.
Copy available from GPO Sup Doc as EP1.23/2:73-164, $1.25; microfiche from NTIS as PB-227 344 $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-164, February 1973. 95 p, 8 fig, 18 tab, 110 ref. EPA roject 12040EJU.

Descriptors: *Waste water treatment, Industrial astes, *Pulp wastes, *Activated carbon, *Water euse, *Reviews, Surveys, Recycling, Municipal ater, Industrial water, Oxidation, *Tertiary treatent.
Identifiers: Collection systems, Solids removal, Lime treatment.

A survey is presented of the literature and other ources on present practices and advanced ethods of handling and treatment of pulp and aper mill effluents, with particular emphasis on he kraft process, and the use of activated carbon nd lime treatment as advanced methods of treatent. The survey was made as a first step of a evelopment program aimed at maximum water euse in kraft pulp and paper mills based on effuent treatment using activated carbon. The esults of the survey include information on acvated carbon and its applications in treatment of ulp and paper mill effluents as well as in treatent of municipal water supplies and effluents. Inormation is presented on lime treatment of kraft ill effluent and on other advanced treatment ethods. It also covers the subjects of in-plant ater reuse, effluent collection systems, solids emoval, and biological oxidation. (EPA)
W74-05110

OMBINED SEWER OVERFLOW FOR THE UDSON RIVER CONFERENCE,
nterstate Sanitation Commission, New York.
. I. Mytelka, L. P. Cagliostro, D. J. Deutsch, and . A. Haupt.
opy availabe from GPO Sup Doc as EP1.23/2:73-52, $2.85, microfiche from NTIS as PB-227 341, 1.45. Environmental Protection Agency, echnology Series Report EPA-R2-73-152, Januay 1973. 287 p, 60 fig, 20 tab, 28 ref. EPA Contract 3-01-0055.

Descriptors: *Combined sewers, *Urban runoff, Hudson River, *Interstate commission, Storm rains, *Sewers, Outfall sewers, *Treatment acilities, *Waste water treatment.
Identifiers: Solids removal, B.O.D. removal, egulators.

A detailed examination was conducted of ten (10) ombined sewer overflow systems within the porion of the Hudson River Basin lying within the Interstate Sanitation District. The work included the entification and study of these combined sewer ystems in order to determine their location, hysical characteristics, and service areas. The rocedure employed included the physical exmination of each system's regulators to deterine their location, type, dimensions, and condion. A study of available records was made to etermine, where possible, trunk line flow, interceptor line design capacity, and characterization f the drainage area served by each regulator hich included population and land use. Ten (10) ummary tables and forty (40) regulator location igures are included. Dry weather and wet weather ampling was also conducted. By-pass loadings for everal pollution parameters have been calculated uring storm flow conditions based upon this samling. Recommendations for minimizing combined ewer overflows are included. (EPA)
W74-05112

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
J. B. Hallowell, J. F. Shea, G. R. Smithson, Jr., A. B. Tripler, and B. W. Gonser.
Copy available from GPO Sup Doc as EP1.23/2:73-247a, $1.90; microfiche from NTIS as PB-229 466, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-247a, September 1973. 168 p, 29 fig, 39 tab, 23 ref. EPA Project 12010 FPK. Contract 14-12-870.

Descriptors: *Metals, Water pollution control, Mining, *Industrial wastes, *Waste water treatment, Costs, *Copper, *Zinc, *Lead, Byproducts.
Identifiers: Nonferrous metals industry, Smelting, Refining.

The purpose was to identify specific research needs in the area of water pollution in the primary nonferrous metals industries. This program consisted of a survey of literature and the acquisition of data from industrial operations. The contents of the final reports (2 volumes) include: the identification of process steps using water and/or generating wastewater, the amounts of water used for various purposes, recirculation rates, amounts of wastewaters, specific or characteristic substances in wastewaters, the prevalence of wastewater treatment practice, methods, and costs; current treatment problems, and plans for future practices of recirculation or wastewater treatment. The metals reported on included copper, lead, zinc, and associated byproducts (arsenic, cadmium, silver, gold, selenium, tellurium, sulfuric acid, salts and compounds), mercury, (primary) gold and silver, aluminum, molybdenum, and tungsten. The information includes detailed processing descriptions and flowsheets, tabulations of quantities of water intake, quantities used by category, recirculated water, discharge water quantities and analyses, water treatment costs. Representative water flowsheets are given. (See also W74-05117) (EPA)
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
J. B. Hallowell, J. F. Shea, G. R. Smithson, Jr., A. B. Tripler, and B. W. Gonser.
Copy available from GPO Sup Doc as EP1.23/2:73-247b, $1.45; microfiche from NTIS as PB-229 467, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-247b, September 1973. 113 p, 16 fig, 30 tab, 31 ref. EPA Project 120/0 FPK. 14-12-870.

Descriptors: *Metals, *Industrial wastes, *Waste water treatment, *Aluminum, *Mercury, *Gold, *Molybdenum, Byproducts, Water pollution control, Mining.
Identifiers: Nonferrous metals, Industry, Smelting, Refining, *Silver, Tungsten.

The trend in the primary aluminum industry is toward reduced or zero discharge of waste water from both alumina refineries and aluminum smelters. The principal treatment needs of the aluminum industry relate to common types of industrial waste water such as cooling tower blow-down and neutralization products, and the specialized need to remove or recover fluoride ion components from fume scrubbers at smelters. The primary mercury industry, by virtue of a current air pollution control problems, may require increased measures of water pollution control associated with air emission control equipment or new processing methods. The primary molybdenum industry, consisting of a small number of operations other than those associated with the copper industry, has taken or is designing effective methods of water pollution control ranging from isolated water systems to changes in flotation reagent concentrations. Plants processing refractory metal concentrates to end products generally are associated with municipal water systems and show high materials recoveries with concurrent close control and careful segregation of waste water streams. Neutralization with filtration of acid wastes is a common practice of the plants surveyed. The small amount of information available for the primary gold and silver industries shows greatly differing practices, ranging from zero discharge in arid climates to problems with mercury and cyanide contents in waste waters. (See also W74-05116) (EPA)
W74-05117

REUSE OF SOLID WASTE FROM WATER-SOFTENING PROCESSES,
IIT Research Inst., Chicago, Ill.
R. D. Nelson, and E. Vey.
Available from NTIS, Springfield, Va. 22151, PB-224 820, Price $4.25 printed copy; $1.45 microfiche. Environmental Protection Agency Office of Solid Waste Management Programs Publication SW-530-56d, 1973. 108 p, 25 fig, 16 tab, 25 ref, 1 append.

Descriptors: *Water softening, *Sludge disposal, *Calcium carbonate, *Illinois, *Water reuse, Filtration, Drying, *Water treatment, Waste disposal, Sands, Solid wastes, *Dewatering.
Identifiers: Water softening sludge, Sludge reuse.

Methods for dewatering a water softening sludge from the village of Park Forest, Illinois, were studied. Uses for the dewatered sludge or ways in which it can be disposed of were evaluated. The initial concentration of the sludge is between 3.6% and 3.9% solids by weight. The sludge solids contain about 84% calcium carbonate, 11% magnesium hydroxide, and 5% miscellaneous and have 90% of the particles in the 1.5 to 30 micron range. The sludge is suitable for use as a mineral filler in paints, floor coverings, caulking compounds, and bituminous products. It can be mixed with sands, clays, and organic soils to improve their workability and strength characteristics. It can also be used as an agricultural liming material to improve workability and fertility of soils. If required, it can be used as a filler in concrete without adversely affecting strength and shrinkage characteristics. The best method of dewatering the sludge is vacuum filtration after gravity thickening. This dewatering method will produce a filter cake of about 45% solids and an almost clear filtrate which can be returned to the plant. (Knapp-USGS)
W74-05127

REMOVAL OF NITROGEN FROM TILE DRAINAGE-A SUMMARY REPORT, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
Copy available from GPO Sup Doc as EP1.16:13030 ELY5/71-6, $0.50; microfiche from NTIS as PB 215 417 $1.45. Water Pollution Control Research Series, May 1971. 30 p, 6 fig, 2 tab, 6 ref. EPA Project 13030 ELY5/71-6. Contract 14-06-200-3389A.

Descriptors: *Waste water treatment, Nitrogen, *Farm wastes, *Water Pollution Control, Biological treatment, Nitrates, Treatment facilities, *Tile drainage, Denitrification, Algae, Algal control, Bacteria, Filtration, Desalination.
Identifiers: *Algal growth, Algal harvesting, *Bacterial denitrification, *Nitrogen removal, Algal stripping.

Studies by an interagency group have shown that it is technically feasible to reduce 20 mg/l nitrate-nitrogen in agricultural tile drainage to 2-5 mg/l by either algae stripping or bacterial denitrification. Conditions necessary for maximum algal growth

included 8- to 12-inch pond depth, addition of small amounts of nutrients (CO_2, Fe, and P), up to four hours of daily mixing and detention times of from 5 to 16 days, depending on the season. The algae were harvested by coagulation-sedimentation followed by vacuum filtration. Bacterial denitrification was tested in anaerobic deep ponds and filters using methanol as a carbon source. Required detention times were on the order of 8 to 50 days for covered ponds (uncovered ponds were not suitable) and 1 to 2 hours for filters. During long-term operation of the filters periodic flushing was required to remove accumulated bacterial biomass. Preliminary cost estimates were $90 and $135 per million gallons for bacterial denitrification (either pond or filter) and algae stripping respectively. Laboratory studies indicated that nitrogen removal effectively lowered the biostimulatory nature of the waste with respect to algal growth in potential receiving waters. Two desalination processes were also studied--electrodialysis and reverse osmosos. Both processes effectively reduced total dissolved solids but neither removed boron, or reduced nitrate to the desired level. (EPA)
W74-05228

SEWERAGE FEASIBILITY STUDY, BROOME COUNTY, NEW YORK, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.
Clinton Bogert Associates, Fort Lee, N.J.
Broome County Sewer Agency, Broome County, New York, June 1969. 17 p, 1 fig, 5 tab.

Descriptors: *Sewerage, *Long-term planning, *Sewage disposal, *Regional development, *Wastewater treatment, *New York, Capital costs, Planning.
Identifiers: *Broome County(New York), Service costs.

For many years Broome County has relied on its major streams, the Susquehanna and Chenango Rivers, for the disposal of untreated and partly treated sewage from its urban core. Suburban areas within the urban core and the Villages of Lisle, Whitney Point, Windsor and Deposit and the developing Harpursville area in Colesville have relied upon individual disposal systems consisting of septic tanks and tile drainage fields for this purpose. The discharge of partly treated sewage has resulted in the gross pollution of streams. As the areas served by septic tanks and tile drainage fields have become more densely developed, increasing numbers of failures have been observed resulting in the overflow of septic tank effluent to the ground surface or to small water courses. These conditions should no longer be tolerated. Estimates made for this report indicate the County population should grow from about 230,000 at present to about 410,000 in 2020. The necessary growth in industrial and commercial facilities requires the extension of sewers to the developing areas that are contiguous to the older population centers in the urban core. Sewer extensions within the next few years should provide service to areas in Chenango, Conklin, Dickinson, Fenton, Kirkwood, Union and Vestal. About 1990, sewer extensions should be required into the Town of Maine. In addition to the urban core, population densities in the Villages of Deposit, Lisle, Whitney Point and Windsor now justify the construction of communal sewers. The Harpursville area in the Town of Colesville should develop to the point where sewers should be justified about 1980. (Poertner)
W74-05233

URBAN WATER RESOURCES--POLITICS OF MANAGEMENT,
Bacon and Thomas, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05235

REGIONAL WATER AND SEWER PLAN, THE MID-MISSOURI REGION.
Preston (D. R.), Holts Summit, Mo.
Mid-Missouri Regional Planning Commission, Jefferson City, Missouri, 1972. 269 p, 80 fig, 6 tab. FHA Grant.

Descriptors: *Planning, *Water supply, *Sewerage, *Regional development, Municipal water, Sewers, Sewage treatment, Water demand, Water resources development.

A plan was prepared to serve as a coordinated guide for the development of water and sewer service to citizens of the Mid-Missouri Region. It is primarily directed to the rural areas and those communities having a population of less than 5,500 persons. The plan provides information on existing water and sewer systems and recommendations for additional systems needed in future years. The plan covers many counties in mid-Missouri the land area of which is predominately rural. The largest urban communities included are Jefferson City, Columbia, Fulton, Mexico, Centralia, Fayette, Booneville, Glasgow, Tipton, California, and Vandalia. A four-step planning process was used in the development of sewer system plan recommendations. This involved inventory of systems, population forecasts, identifying deficiencies, and analysis of the foregoing. General recommendations in both map and text form are given for each community in the region. The water system plan is divided into two related sections. The first concerns public water supply districts while the second concerns municipal water supply systems. Planning the water systems involved making an inventory of existing systems, applying general standards against the existing systems and population projections, and analysis of the foregoing. There are thirty public water supply districts in the mid-Missouri Region. They vary in size and serve rural areas having from 70 customers to more than 1,000 users. The total population served in 1972 was about 26,000 persons. (Poertner)
W74-05238

AREA-WIDE WATER AND SEWERAGE SYSTEM PLAN AND CAPITAL IMPROVEMENT PROGRAM.
Harte (John G.) Associates, Inc., Atlanta, Ga.; and Harris (Frederic R.), Inc., Jacksonville, Fla.
Coastal Area Planning and Development Commission, Brunswick, Georgia, May 1973. 215 p, 100 fig, 8 tab. HUD grant CPA-GA-04-04-1002.

Descriptors: *Regional analysis, *Water supply, *Sewerage, *Long-term planning, *Capital costs, *Georgia, Regional development, Future planning, Water resources development, Municipal water, Sewers, Sewage treatment, Industrial wastes, Atlantic coastal plain, Water demand, Waste disposal wells.
Identifiers: *Capital improvement program.

A review and updating of water and sewer studies made previously by the Coastal Area Planning and Development Commission is presented. Included is a summary of improvements proposed in reports of engineering studies. Priorities, projected programs, cost estimates and financing recommendations are given for meeting water supply and sewage disposal needs through 1990. Population and economic trends for the region are discussed. These statistics indicate that in other than the major municipalities and their suburbs, growth will be slow. For this reason, programs in the rural areas are largely limited to solving existing public health problems related to improper individual water supply and sewage disposal facilities. The most severe problems facing the major municipalities in the study area are the deterioration of the quality of the water supply brought on by concentration of industrial wells in relatively small areas and the inadequacy of sewerage facilities. The population growth in unincorporated areas around the major municipalities has also resulted in an urgent need for public water and sewer service. (Poertner)
W74-05242

SAGINAW COUNTY WATER AND WASTE WATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., Sout Bend, Ind.
Saginaw County Metropolitan Planning Commi sion, Saginaw, Michigan, May 1971. 245 p, 26 fi 4 tab, 4 appendices. HUD Mich. P-299 (G).

Descriptors: *Planning, *Water supply *Sewerage, *Waste water disposal, *Michiga Municipal water, Water demand, Water resource development, Long-term planning, Storm drain Capital costs.
Identifiers: *Saginaw County(Michigan).

Guidelines were prepared in the form of an e gineering-planning report for use in the form adoption of the water and wastewater utilities el ment of the County Development Plan. The repo investigates the present status of the County's e isting water and wastewater utilities and propos county-wide water and wastewater utility mast plans to the year 1990. Summaries are presente for projects currently under construction and co estimates of proposed improvements, required implement the master plans during the short a long range planning periods, are include Background information is given concerning t County's planning goals and policies, populati history and projections, natural physical chara teristics, water resources, conservation of t water resources, water and wastewater treatme and preliminary information on storm wat drainage problems. (Poertner)
W74-05243

TREATMENT FOR CLARIFYING WHIT WATER COMING FROM A GROUNDWOO PULP MILL (TRATAMIENTO PARA L CLARIFICACION DE AGUA BLANC PROCEDENTE DE LA FABRICACION D PASTA DE MADERA),
F. Kohn Cornejo.
ATCP (Association Mexicana de Technicos de l Industrias de la Celulosa y del Papel), Vol 13, N 1, p 17-20, Jan/Feb 1973. 1 fig, 2 tab, 3 ref.

Descriptors: *Pulp wastes, *Mexic *Flocculation, *Coagulation, *Waste water tre ment, Operating costs, Cost-benefit ratio, *Wat reuse, Recirculated water, Additives, Pulp a paper industry, Slime, Electrolytes, Aluminu Silica, Industrial water.
Identifiers: *White water, Groundwood mil Mechanical pulping, Clarifiers, Flocculan Coagulants, Polyelectrolytes, Alum(Aluminu potassium sulfate), Aluminum compounds, A tivated silica, Chemical consumption.

White water from the grinder room of a groun wood (mechanical pulp) mill was purified in clarifier basin with addition of flocculants, notab alum, activated silica, and polyelectrolyte. T treated water was found suitable for reuse process water in a paper mill without requiri microbicidal or algaecidal additives for slime co trol. The treatment cost slightly over 20 cents p cu m of clarified water. (Speckhard-IPC)
W74-05245

WASTE WATER TREATMENT: USING PU OXYGEN FOR SECONDARY TREATMENT,
Union Carbide Corp., Tonawanda, N.Y.
L. C. Matsch, and W. C. Dedeke.
Complete M/S (21 p) available from A.I.Ch Publications Dept., New York, N.Y. 10017. C $5.00. Chemical Engineering Progress, Vol 69, 8, p 75-76, Aug 1973.

Descriptors: *Waste water treatment, *Oxidati *Oxygen, *Pulp wastes, *Aeration, Suspend solids, Sludge, Sedimentation, Settling veloci Sedimentation rates, Pilot plants, *Virginia, P and paper industry, Dewatering.

he 'Unox' oxygen treatment system of Union arbide Corp. is said to offer several advantages ver the use of air for effluent aeration treatments. mong them are the ability to operate at higher oncentrations of mixed liquor suspended solids, ster sludge settling rates, more concentrated unerflows, a lesser amount of excess solids generaon, superior dewatering ability of the sludge, and etter resistance to occasional process shocks. esults are given of pilot plant trials at the West oint, Virginia, pulp mill of Chesapeake Corp. of irginia. (Hansen-IPC)
74-05247

STARCH-FREE EFFLUENT PROGRAM FOR ORRUGATING PLANTS,
anada Starch Co. Ltd., Montreal (Quebec).
or primary bibliographic entry see Field 5B.
74-05250

ADIATION OXIDATION OF WATER ADMIXURES IN WATER-CONTAINING HUMAN ASTES (IN RUSSIAN),
. V. Bychkov, A. N. Kasperovich, V. V. rasnoshchekov, V. P. Plotnikova, and Yu. E. nyak.
osm Biol Med, Vol 6, No 6, p 44-47, 1972, Enish summary.
entifiers: Admixtures, Human wastes, Oxidation, *Radiation, *Water purification, Waste water treatment. Toxicity.

ne radiation method for purifying water-containg human wastes from organic admixtures in the esence of hydrogen peroxide was developed. ne effect of radiation dosages on the oxidation of ganic admixtures was studied. The toxicological aluation of regenerated water was performed.--opyright 1973, Biological Abstracts, Inc.
74-05252

ETHANOL DISTRIBUTION IN AN EVAPORAION PLANT,
lleruds A.B., Saffle (Sweden).
. G. I. Arne, and S. Bergkvist.
ensk Papperstidning, Vol 76, No 10, p 380-382, ne 17, 1973. 2 fig, 2 tab, 4 ref.

escriptors: Water pollution sources, *Pulp astes, *Alcohols, *Biochemical oxygen demand, ater reuse, *Waste water treatment, Industrial astes, *Evaporators, *Condensation, Pulp and per industry, Treatment facilities, Steam, Heat changers, Waste disposal.
entifiers: Kraft pulp mills, Scandinavia, Consates, Black liquors, Methanol(Or Methyl alhol).

ondensates from the evaporators of modern aft mills are usually collected into a single eam from which a portion is withdrawn for use in other mill departments while the mainder is sewered and contributes to the BOD ad of the receiving stream, mainly due to ethanol being present. The distribution of ethanol in various streams of a Scandinavian aporation plant was calculated, using general stillation rules, and the results were verified exrimentally. They showed that, for the customary -IV-V-I-II sequence of liquor feeds, the condenes from the first surface condenser and from effcts II and III (including the liquor preheaters) ntain only small amounts of methanol and can us be sewered to make room for the reuse of effct IV and V condensates which contain the main rtion of methanol. Because of their small lume and high methanol concentration, condenes from liquor preheater IV and from the cond surface condenser can be treated by steam ipping, using the Uddeholm system. The accuulation of methanol to be expected from condence reuse may be reduced by increasing the steam nt from effect V and by providing it with an tra heat exchanger. Overall results of calculans and experiments indicate that a considerable reduction of condensate-caused water pollution is feasible. (Brown-IPC)
W74-05253

EFFECTS OF WASTE WATER RECYCLE IN A PAPERBOARD MILL,
Green Bay Packaging, Inc., Wis.
D. C. Morris.
Journal Water Pollution Control Federation, Vol 45, No 9, p 1939-1945, Sept. 1973. 5 fig, 3 ref.

Descriptors: Recirculated water, *Reverse osmosis, *Recycling, *Waste water treatment, *Pulp wastes, *Water reuse, Water conservation, *Corrosion, Maintenance, Operation and maintenance, *Wisconsin, Pulp and paper industry, Sulfite liquors, Water vapor, Humidity, Water circulation.
Identifiers: Sulfite pulp mills, NSSC(Neutral sulfite semichemical) pulping, Spent sulfite liquors, Board mills, Paper machines, Exhaust hoods.

A reverse osmosis process was installed at the NSSC (neutral sulfite semichemical) pulp and paperboard mill of Green Bay Packaging Inc. at Green Bay, Wisconsin, to concentrate dilute waste waters so that they could be mixed with stronger wastes before final treatment. Because reverse osmosis is expensive, substantial in-house recycling was practiced to reduce the volume of dilute wastes to be treated. The recycling procedure caused higher mill temperatures and humidities and shortened the service life of equipment through corrosion by the greater concentration of chemicals dissolved in circulating vapors and liquids. A hood had to be installed over the paper machine to protect the hall's roof from condensation droplets. Equipment maintenance also increased accordingly. (Witt-IPC)
W74-05254

WATER AND WASTE WATER PROBLEMS IN MODERN TEXTILE FINISHING PLANTS (WASSER- UND ABWASSERPROBLEME IM MODERNEN TEXTILVEREDLUNGSBETRIEB),
A. Stiebert.
Melliand Textilberichte, Vol 54, No 8, p 864-870, Aug. 1973. 3 ref.

Descriptors: *Textiles, *Water pollution sources, *Industrial wastes, *Waste water treatment, Water conservation, *Recycling, Economic efficiency, *Water reuse, Water purification, Dyes, Dye concentrations, Education, Manpower, Training, Costs, Biological treatment, Disinfection, Water softening, Corrosion, Sludge disposal, Organic loading.
Identifiers: Textile finishing, Mercerization.

Ground waters (well waters) and surface waters for use in textile finishing operations may require various pretreatments for removal of hardness, algae, coliform bacteria, and corrosive components. Waste water problems of the textile finishing industry involve mainly dyes, fixatives, the recovery of mercerizing liquors, sludge disposal, and general economic decisions. Several practical solutions to these problems are discussed. Outside consultants are not the sole answer, since local conditions influence results. Education and training of factory workers are essential to the success of any treatment installation. Water conservation through recycling is gaining in importance. A comparison of costs for different water purification processes indicates that biological effluent treatments are both difficult and costly. It is proposed to treat effluents containing strong organic loadings separately and to pass them to a municipal installation for biological processing. (Brown-IPC)
W74-05255

EFFLUENT -- FIBRE RECOVERY -- WATER SAVINGS: A METHOD TO ANALYSE AND TACKLE THE PROBLEMS,
K. D. Blundell.
Paper (London), Vol 179, No 3, p 118, 120-122, Feb. 7, 1973. 1 fig.

Descriptors: *Waste water treatment, *Pollution abatement, Water conservation, *Pulp wastes, *Pulp and paper industry, *Treatment facilities, Equipment, Biochemical oxygen demand, Suspended solids, Color, Cooling, Thermal pollution, Sludge treatment, Sludge disposal, Dewatering, Effluents, Waste treatment, Water pollution treatment.
Identifiers: Paper mills, Board mills, Savealls, Fiber recovery, Concentrating(Dewatering).

A broad outline is given of a systematic approach to the solution of effluent disposal, fiber recovery, and water conservation problems in paper and paperboard mills. Types of available equipment are described for dealing with fluctuating effluent volumes, for reducing the BOD and solids content of effluents, cooling thermal discharges, removing color bodies, and for concentrating and disposing of sludges. Guidelines to the selection of the most suitable facilities for specific conditions are also given, along with a list of available fiber-recovery units or savealls. (Witt-IPC)
W74-05257

QUICK BROWN FOX DOESN'T TRIP OVER THILMANY'S EFFLUENT ANYMORE,
M. MacLeod.
Paper Trade Journal, Vol 157, No 20, p 36-40, May 14, 1973. 4 fig.

Descriptors: *Treatment facilities, *Pulp wastes, *Wisconsin, *Pulp and paper industry, *Water conservation, Economic impact, Water reuse, Effluents, Pollution abatement, *Waste water treatment, Industrial wastes, Costs, Capital costs.
Identifiers: Kraft mills.

Thilmany Pulp and Paper Co., a division of Hammermill Paper Co., operates an integrated kraft pulp and paper mill and converting plant at Kaukauna, Wisconsin, on the lower Fox River. An environmental improvement program costing ca. $2.4 million was successfully financed via a municipal revenue bond issue and was recently completed to supplement existing treatment facilities. The installation comprises both external and internal effluent treatment measures. Internal water conservation measures include an extended white water collection system, high-pressure machine cleaning showers, reuse of decontaminated evaporator condenser water, and fiber-recovery savealls. The external treatment of 23 million gal/day of waste water involves an 186-ft diameter clarifier basin designed to remove 75% of suspended solids and 50% of 5-day BOD, a centrifugal sludge dewatering system employing pressure filters, and two biological oxidation lagoons of 30 million gal capacity each. A flowchart of the entire system, including auxiliary equipment, is included. (Witt-IPC)
W74-05258

THE PURIFICATION OF RESIDUAL WASTE WATERS OF THE SULFITE PULP INDUSTRY (DIE REINIGUNG VON RESTABWAESSERN DER SULFITZELLSTOFF-INDUSTRIE),
Cellulose Attisholz A.G., Luterbach (Switzerland).
A. Scherler.
Das Papier, Vol 26, No 10A, p 637-642, Oct. 1972. 8 fig, 2 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Bleaching wastes, *Sulfite liquors, Pulp and paper industry, Biological treatment, Capital costs, Operating costs, Costs, Economic efficiency, Biochemical oxygen demand, Chemical oxygen demand, Europe, Waste treatment, Ef-

fluents, Water pollution sources, Eutrophication, Treatment facilities.
Identifiers: *Switzerland, Attisholz process, Bentonite process, Evaporation condensates, Bleach plants, Sulfite pulp mills, Spent sulfite liquors, Ammonium base sulfite process, Acid sulfite pulping.

With exception of ammonium-base spent sulfite liquor, which may contribute to water eutrophication, the effluents generated by various acid sulfite pulping processes do not differ sufficiently in water pollution loads to warrant switching from one to another for environmental protection only. The biological treatment of sulfite mill effluents, especially the problems posed by evaporator condensates and bleach plant waste waters, are discussed, with emphasis on the Attisholz process. Among nonbiological treatment processes, which are increasing in popularity, the Bentonite process used at a Swiss sulfite pulp mill is of special interest. Assuming that 97% of all effluents are subjected to combined mechanochemical plus biological treatment, one can expect a reduction in 5-day BOD to 9-10 kg per 100 kg of oven-dry pulp produced. The achievable degree of purification is somewhat less for softwood-derived than for hardwood-derived sulfite mill effluents. Typical COD and BOD balances are illustrated. A two-stage biological treatment plant designed for a hydraulic load of 2500 cu m/hr and a 5-day BOD loading of 18 t/day would require an investment of 12.6 million Swiss francs. Operating costs are estimated at 2.35 million francs. Together with interest charges of 1.2 million francs, the total cost for waste water purification runs to 0.158 francs/cu m. (Wise-IPC)
W74-05260

SURVEY OF RESIDUAL WASTE WATER TREATMENT (UEBERBLICK UEBER DIE BEHANDLUNG DER RESTABWAESSER),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungesstelle.
W. Brecht.
Das Papier, Vol 26, No 10A, p 625-628, Oct. 1972. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Pulp and paper industry, *Biological treatment, Waste water(Pollution), Water pollution sources, Organic loading, Biochemical oxygen demand, Effluents, Industrial wastes, *Pollution abatement, Sludge disposal, Europe, Waste treatment, Regulation, Legislation, Governments.
Identifiers: Paper mills, Pulp mills, Sulfite pulp mills, White water, Germany, Switzerland.

Increasingly strict government regulations for water quality control in Germany will force pulp and paper mills to add secondary (biological or nonbiological) treatment facilities to their primary mechanical-chemical effluent purification installations, so as to remove organic pollutants in addition to suspended solids. The major effluent treatment methods available to the pulp and paper industry are listed, and disposal of the resulting sludge is also mentioned. Differences in the characteristics of paper vs. pulp mill wastes are pointed out, as they affect the selection of an adequate treatment sequence. Thus, residual paper mill white water contributes only about 6 kg of 5-day BOD per ton of paper to the pollution load, compared to 50 kg of oxygen per ton of sulfite pulp produced. The former load is equivalent to the sewage generated daily by 80 people, the latter equivalent to that produced by a population of 750. Several Swiss sulfite mills had to shut down for environmental protection reasons. (Wise-IPC)
W74-05261

BIOLOGICAL AND NONBIOLOGICAL PROCESSES FOR REMOVING DISSOLVED ORGANIC SUBSTANCES FROM RESIDUAL WASTE WATERS (BIOLOGISCHE UND NICHTBIOLOGISCHE VERFAHREN ZUR ENTFERNUNG GELOESTER ORGANISCHER SUBSTANZEN AUS RESTABWAESSERN),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
H-L. Dalpke.
Das Papier, Vol 26, No 10A, p 631-635 (discussion p 635-637), Oct. 1972. 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Organic wastes, Pulp and paper industry, *Aerated lagoons, *Activated sludge, *Biological treatment, Filtration, Filters, *Trickling filters, Biodegradation, Oxidation, Adsorption, Incineration, Electrolysis, Electrodialysis, Flotation, Catalysts, Reverse osmosis, Chemical precipitation, Radiation, Ion exchange, Evaporation, Freeze drying, Ion transport, Organic loading, Dissolved solids, Effluents.
Identifiers: Concentrating(Thickening), Wet combustion(Chemical oxidation), Electroflotation.

Three types of biological effluent treatment processes are distinguished: (1) Aerated stabilization ponds merely accelerate natural bio-oxidative degradation of pollutants. (2) Single- and multistage activated sludge processes can operate with surface aeration or pressure aeration. (3) Fixed biological substrates, such as trickling filters, have been used commercially, but generally less effectively than activated sludge methods, of which a great variety are possible. Among nonbiological processes outlined are (1) adsorption (on activated carbon, flyash, sludge-derived coke, or synthetic adsorbents); (2) catalytic oxidation; (3) wet combustion (at high or low pressure); (4) direct-current treatments (electroflotation, electrodialysis, and electrolysis); (5) chemical precipitation (with or without chemical recovery); (6) reverse osmosis; (7) ion-exchange; (8) gamma-irradiation; (9) thickening or concentrating (by evaporation or freeze drying). The relative merits of these (largely still experimental) nonbiological methods are pointed out, with special regard to their applicability in the pulp and paper industry. (Wise-IPC)
W74-05262

REMOVAL OF RESIDUAL WASTE WATER SLUDGES (BESEITIGUNG DER RESTABWASSERSCHLAEMME),
Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany).
G. Strittmatter.
Das Papier, Vol 26, No 10A, p 649-654 (discussion p 654-657), Oct. 1972. 8 fig, 3 ref. English summary.

Descriptors: *Sludge treatment, Sludge disposal, *Waste water treatment, *Pulp wastes, *Dewatering, *Drying, *Byproducts, *Incineration, Fertilizers, Recycling, Solid wastes, Humus, Fibers(Plant), Fuels, Filters, Filtration, Centrifugation, Treatment facilities, Equipment, Sedimentation, Settling basins, Separation techniques, Industrial wastes.
Identifiers: Composting, Vacuum filters, Presses, Screw presses, Filter presses, Belt filters, Boards, Board mills, Insulation boards, Panel boards, Paperboards, Building boards, Fiberboards, White water.

All pulp and paper mill waste water treatments produce fibrous sludge, regardless of whether they use chemical, mechanical, biological, or combined processes. Since the dry solids content of sludges ranges from 1 to 8%, economical handling methods require thickening (concentrating), dewatering, and drying steps prior to disposal or reuse. Equipment and techniques available for these processing steps are reviewed and illustrated, notably decanters, skimmers, centrifuges of various kinds, hydrostatic and vacuum filters, and filter, belt, and screw presses. While the solids-liquid separation technology has made significant strides, problems of satisfactory sludge disposal still await adequate solutions. Among reported commercial possibilities of sludge reuse are composting (to humus), combustion (as fuel), an resale to mills making paperboards, panel board insulation boards, and flame-retardant buildi boards. (Wise-IPC)
W74-05263

INSTALLATION OF WASTE WATER AN SLUDGE TREATMENT FACILITIES AT TH ARJOMARI-PRIOUX PAPER MILL AT RIVE SUR-FURE (INSTALLATION DE TRAITEMEN DES EAUX RESIDUAIRES ET DES BOUES D LA PAPETERIE ARJOMARI PRIOUX A RIVE SUR-FURE).
Papier, Carton, Cellulose, Vol 22, No 1-2, p 40-4 January-February 1973. 6 fig, 2 tab.

Descriptors: *Waste water treatment, *Treatme facilities, *Pulp wastes, Europe, *Flocculatio *Coagulation, *Sludge treatment, Pulp and pap industry, Operating costs.
Identifiers: Sedimat flocculator, Clarifie *France.

Automated waste water and sludge treatme facilities at a French paper mill are describe They center around a 'Sedimat' flocculator-clari er which permits sludge recirculation. Chemi (coagulant) consumption and operating periences are reported. (Speckhard-IPC)
W74-05264

WHITHER CLARIFIED SLUDGE. (WOHIN M DEM KLAERSCHLAMM.),
For primary bibliographic entry see Field 5E.
W74-05266

PURIFICATION OF BLEACHED KRAFT MI EFFLUENTS BY ACTIVATED SLUDGE TREA MENT (OCZYSZCZANIE METODA OSA CZYNNEGO SCIEKOW Z PRODUKCJI MA CELULOZOWEJ SIARCZANOWEJ BIELONE
Z. Skwara, K. Lelonkiewicz, and C. Leszczynsk
Przeglad Papierniczy, Vol 29, No 5, p 178-1 May 1973. 2 tab, 2 fig, 23 ref. English summary.

Descriptors: *Activated sludge, *Biological tre ment, *Pulp wastes, *Bleaching wastes, *Wa water treatment, *Aeration, Evaporati Biochemical oxygen demand, Settling basi Nutrients, Phosphates, Sulfates, Ammoni salts, Organic loading, Suspended solids, Euro Pulp and paper industry, Laboratory tests.
Identifiers: Kraft mills, *Poland, Condensat Evaporator condensates, Black liquors, Wh water.

Two kinds of effluents from the Kostrzyn k mill (Poland) were subjected to laboratory tre ments with activated sludge to study the effects aeration time, BOD loading, and proportion evaporator condensates. Both effluents contai ca. 100 mg oxygen per liter. One stream came fr the digester room, pulp washing and screeni bleaching, and the pulp-drying machine ('V machine'). It was mixed in 4:1 and 2:1 ratios v the other stream coming from the soda recov boiler, black liquor evaporator, causticizer, sulfate soap acidulation plant. After 1-hr sedim tation of suspended solids, both mixtures w aerated in 4 different tanks with addition of monium sulfate and potassium dihydro phosphate in the nitrogen to phosphorus r 2.5:0.5 per 100 parts of 5-day BOD, and with adjusted to 7.5. Activated sludge from second settling tanks was recycled to the continuously aeration tanks (8 liter capacity each). The B load was kept at 0.1 or 0.13-0.15 g per g of slu per day. BOD reductions observed were 77% a 4 days and 90% after 7 days, using relatively sludge concentrations (1-2 kg/cu m). Increasing proportion of evaporator condensates in the fluent reduced the BOD removal to 87. (Stapinski-IPC)
W74-05267

HOW MUCH WILL CLEANUP COST,
F. G. Hurtubise, D. Jones, and H. D. Paavila.
Pulp and Paper Magazine of Canada, Vol 74, No 9, p 48, 50, Sept. 1973.

Descriptors: *Economic impact, *Treatment facilities, *Pulp and paper industry, *Canada, *Pollution abatement, *Costs, Capital costs, Operating costs, Water reuse, Water consumption(Excluding consumptive use), Legislation, Regulation, Water quality standards, Water quality control, Waste water treatment.

Under regional antipollution regulations, the Canadian pulp and paper industry spent $195 million in 1960-1971 on water pollution abatement, viz., $130 million for in-plant improvements and $65 million on external treatment facilities. These measures reduced effluent BOD by 33%, water use by 19%, and suspended solids by 72% per ton of product. The 1971 federal water quality standards will require additional investments of $9,700 capital plus $3.91 operating cost per daily ton produced. Meeting the program's goal will cost the Canadian industry over $500 million. Data from a survey of various mills are included to support these estimates. (Brown-IPC)
W74-05268

COMBINED MILL EFFLUENT GOES TO AERATION POND IN PE (POLYETHYLENE) PIPELINE.
Pulp and Paper, Vol 47, No 4, p 112-113, April 1973. 2 illus.

Descriptors: Treatment facilities, *Pulp wastes, *Pipelines, *Plastics, *Bleaching wastes, *Waste water treatment, Industrial wastes, *Construction materials, Steel, *Oregon, Pulp and paper industry, Aerated lagoons, Corrosion.
Identifiers: Polyethylene, Willamette River(Oregon), Materials handling.

At the pulp and paper mill of Boise Cascade Corp. in Salem, Oregon, a high-density polyethylene pipeline was installed to convey effluents to an aeration pond for secondary treatment prior to discharge into the Willamette River. The pipeline carries a mixture of spent sulfite cooking liquor, each plant effluent, evaporator condensate, and paper mill white water. Resistance to corrosive liquids and ease of installation on land and under water are the major advantages of polyethylene over conventional wrapped or coated steel pipe. (Witt-IPC)
W74-05269

POLLUTION -- YESTERDAY, TODAY, AND TOMORROW,
J. W. Beak.
Pulp and Paper Magazine of Canada, Vol 74, No 9, p 25-26, 28-29, Nov 1973. 1 illus.

Descriptors: *Pollution abatement, *Pulp and paper industry, *United States, *Canada, Attitudes, Psychological aspects, *Social aspects, Environmental control, Regulation, Legislation, Water quality standards, Governments.
Identifiers: Public relations, Cooperation.

Changes in water pollution by the Canadian pulp and paper industry and in abatement technology, economics, and attitudes from the 1950's to the present are discussed. Lessons to be learned from past over- and underreactions to environmental problems in North America are emphasized. The importance of good clean housekeeping practices is illustrated, along with the need to look beyond plant control measures. The paper industry must regain public confidence that it can and does operate without disrupting the environment. Cooperation with the proper authorities should convince the latter that their insistence on nationwide uniform effluent standards is not the answer to local situations. The vital function of professional consultants and service industries in fostering sound, objective attitudes is keynoted. (Brown-IPC)
W74-05272

MEASURES AGAINST WATER POLLUTION IN MECHANICAL PULP AND PAPER MILLS,
Stora Kopparbergs Bergslags A.B., Kvarnsveden (Sweden). Kvarnsvedens Pappersbruk.
A. Wichman.
Pure and Applied Chemistry, Vol 29, p 291-298, 1972. 2 fig, 3 ref.

Descriptors: *Waste water treatment, *Pulp wastes, Europe, Pulp and paper industry, Flotation, Flocculation, Sedimentation, Research priorities, *Pollution abatement.
Identifiers: *Sweden(Kvarnsveden), Newsprint mills, Groundwood mills.

A description is given of water pollution control measures taken at the groundwood and newsprint mill of Stora Kopparberg Bergslags AB. in Kvarnsveden, Sweden. The need for further fundamental data on the mechanisms of flotation, flocculation, and sedimentation processes is emphasized. An appeal is made for cooperative research by all parties interested in water pollution abatement and environmental protection. (Buchanan-IPC)
W74-05273

RECYCLING WATER -- A SIMPLE SOLUTION,
Masonite Corp., Laurel, Miss.
J. E. Leker, and W. C. Parsons.
Southern Pulp and Paper Manufacturer, Vol 36, No 1, p 32-34, Jan 10, 1973. 4 fig, 10 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Recycling, *Water quality control, *Recirculated water, *Mississippi, Pulp and paper industry, Effluents, Water reuse, Reclaimed water, Evaporation, Evaporators, Suspended solids, Byproducts, Biological treatment, Aerated lagoons, Sludge treatment, Incineration, Sludge disposal, Discharge(Water), Sedimentation, Settling basins.

Difficulties of finding simple solutions to meeting antipollution water quality standards are discussed in the context of waste water treatment measures taken at Masonite Corp.'s pulp and board mill in Laurel, Mississippi, where a facility was designed for treating 7 million gal of effluent per day according to standards existing in 1970. An initial survey showed that the mill produced daily 257,000 lb of BOD and 40,000 lb of suspended solids. About 90% of the BOD was contained in the wash water from steam-processed pulp which amounted to less than 15% of the total waste water flow. This stream of wash water is concentrated in a quintuple-effect evaporator. Residual solids are converted into a marketable product. Two other effluent streams (process water plus cooling, sealing, and housekeeping waters) are handled separately in primary clarifiers from which 90% of treated water is recycled to the mill, the remainder being diluted with the second stream and treated in a biological contact-stabilization system. Overflows pass to a 10-acre aerated lagoon for polishing before reuse or discharge. Sedimented solids from the primary treatment are burned, disposed of as landfill, or utilized in other industries. An unsolved problem is the disposal of 20 t/day of excess biological sludge which is difficult to dewater. (Hansen-IPC)
W74-05274

EFFLUENT-FREE BLEACHED KRAFT PULP MILL: PRESENT STATE OF DEVELOPMENT,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
H. W. Rapson, and D. W. Reeve.
Tappi, Vol 56, No 9, p 112-115, Sept. 1973. 2 fig, 25 ref.

Descriptors: Water conservation, *Water reuse, *Pulp and paper industry, *Bleaching wastes, *Pulp wastes, Effluents, *Waste water treatment, Chlorine, Equipment, Sodium sulfate, Evaporation, Sodium chloride, Waste water(Pollution), Water circulation, Reclaimed water, Recirculated water.
Identifiers: Wash water, Evaporator condensates, Bleach plants, Kraft mills, Chlorine dioxide, Spent liquors, R-3 chlorine dioxide bleaching process, Pulp washing, Countercurrent processes, White liquors, Chemical recovery.

All aqueous effluents from bleached kraft pulp mills can be eliminated by recoverying and reusing all the water and chemicals required for bleaching. None of the process changes that would be involved are radical departures from existing technology, and none of the equipment needs are novel. Pulp can be washed completely countercurrently, from the last washer in the bleach plant to the first brown stock washer. A substantial portion of chlorine in the chlorination stage can be substituted by chlorine dioxide. Evaporator condensates can be steam- and air-stripped and reused to wash the bleached pulp. Salt (NaCl) is recoverable from the spent bleach liquor by evaporation of the white liquor and may be used to regenerate bleaching chemicals. All the chlorine and chlorine dioxide needed for bleaching, as well as the sodium sulfate used as cooking liquor makeup, are presently producible in the so-called 'R-3' process by the chlorine dioxide generator-evaporator-crystallizer. The design and development status of effluent-free kraft mills is discussed in the light of these possibilities. (Brown-IPC)
W74-05275

A MATHEMATICAL MODEL FOR OPTIMIZING THE DESIGN OF REVERSE OSMOSIS SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
I. K. Bansal, and A. J. Wiley.
Tappi, Vol 56, No 10, p 112-115, Oct 1973. 3 fig, 9 ref, 4 tab.

Descriptors: *Reverse osmosis, *Waste water treatment, *Pulp wastes, *Optimization, *Mathematical models, *Simulation analysis, *Cost analysis, Cost-benefit analysis, Operating costs, Capital costs, Effluents, Maintenance, Osmotic pressure, Flow, Depreciation, Design data, Water pollution treatment, Reclaimed water, Pulp and paper industry, Sodium chloride, Pipelines.
Identifiers: Concentrating(Dewatering), Flux rate, Salt rejection.

A computerized mathematical model was developed for the optimal design of large-scale reverse osmosis (R.O.) systems to be used for concentrating dilute effluents of the pulp and paper industry. The model calculates the number of modules needed and their best configuration by optimizing the capital and operating costs of a large multistage concentrating system. This model was found to be sensitive to the reference NaCl flux rate, the osmotic pressure of liquors being processed, module depreciation, module cost per square foot of membrane, and module maintenance cost. Agreement between experimental data and results obtained with the mathematical model was within 10%. For the design of a manifolding and piping system of R.O. units, the number of modules operated in series seemed to be more important than the number of stages and the recovery ratios of water in each stage. Probably, the equivalent of two 18-tube modules in series (250-300 total linear feet) is optimum for 1/2-inch inside-diameter tubular modules, based on present capital and operating costs of an R.O. concentrating system. (Brown-IPC)
W74-05276

ECONOMIC IMPACT OF POLLUTION ABATEMENT ON THE SULFITE SEGMENT OF THE U.S. PULP AND PAPER INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
C. Canty, F. G. Perry, Jr., and L. R. Woodland.
Tappi, Vol 56, No 9, p 52-55, Sept. 1973. 1 fig, 2 ref, 2 tab.

Descriptors: Cost-benefit ratio, Sulfite liquors, Pulp wastes, *Economic impact, *Pulp and paper industry, *Pollution abatement, *Regulation, *Treatment facilities, *Waste water treatment, Bleaching wastes, Water quality standards, Water quality control, Effluents, Capital costs, Operating costs, Legislation, Industrial wastes, Discharge(Water), Water pollution sources, Profit, Unemployment, Incineration, Byproducts, Biological treatment, United States.
Identifiers: Sulfite pulp mills, Spent sulfite liquor, Spent pulping liquors, Chemical recovery.

The probable impact of antipollution legislation on the economies of U.S. sulfite pulp and paper mills is discussed. The most serious effluent problem is caused by spent sulfite pulping liquors. Three treatment methods are compared with regard to efficiency and costs, viz., biological process, by-product recovery, and incineration. Capital investments and operating costs for treatment of spent bleach plant liquors, for removal of suspended solids, and for air pollution control are also presented. Seven U.S. sulfite mills having a total production capacity of 400,000 tons/year may not be able to cope with regulatory water quality demands, and may close down by 1976. Four additional mills with 470,000 t/yr combined capacities are operating with marginal profitability. Although shutdowns may cause regional temporary unemployment, salutary effects should include improved product supply-demand balance and better water utilization with increased recovery of fibers, chemicals, and heat to help reduce the pollution abatement costs. Most mills will incur comparable expenses to meet water quality standards and should be able to remain competitive. (Brown-IPC)
W74-05277

CHARACTERIZATION OF SULFITE PULPING EFFLUENTS AND AVAILABLE ALTERNATIVE TREATMENT METHODS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. O. Blosser, and I. Gellman.
Tappi, Vol 56, No 9, p 46-50, Sept. 1973. 3 tab, 7 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Pollution abatement, *Waste water treatment, *Water pollution sources, Regulation, Pulp and paper industry, United States, Management, Decision making, Treatment facilities, Industrial wastes, Pennsylvania, Washington, Florida, Effluents, Waste water(Pollution).
Identifiers: Chemical recovery, Pulp mills, Sulfite pulp mills.

The sources, volumes, compositions, and other characteristics of effluents from sulfite pulp mills using Ca-, Mg-, Na-, or ammonia-base cooking liquors are reviewed. Trends in the adoption of various chemical recovery systems, installation of accompanying external effluent treatment facilities, and decisions on expansion vs. termination of sulfite mills in response to pollution control regulations are described. Case histories are presented to document the viability of various management decisions, notably the measures adopted at Charmin Paper Products Co. (Mehoopany, Pa.), Crown-Zellerbach Corp. (Camas, Wash.), ITT Rayonier Inc. (Fernandina Beach, Fla.), and Weyerhaeuser Co. (Cosmopolis, Wash.). (Brown-IPC)
W74-05278

HOT PROBLEM SOLVED BY AERATED LAGOON,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
C. E. Adams.
Water and Wastes Engineering, Vol 9, p E8-E11, Sept. 1972. 5 tab, 1 diag.

Descriptors: Cooling, *Cooling towers, *Aerated lagoons, *Waste water treatment, *Pulp wastes, Cost-benefit ratio, *Economic efficiency, Operating cost, Capital cost, *Thermal pollution, Effluents, Pulp and paper industry, Temperature, Lagoons, Biological treatment, Industrial wastes.

A computer program was developed for comparing the merits of an aerated lagoon with those of a cooling tower for the purpose of reducing the temperature of paper mill effluents to a level suitable for biological treatment. For the particular case studied, aeration proved to be more economical than a cooling tower. Aeration required more land, but this was offset by the initial cost of the tower. The deciding factor was the high operating cost for pumping the wastes to the tower. In regions where land is more expensive, cooling towers could be the more economical way of preventing thermal pollution. (Buchanan-IPC)
W74-05280

CLOSED WATER CIRCULATION SYSTEM IN A PAPER AND PAPERBOARD MILL (GESCHLOSSENER WASSERKREISLAUF IN EINER PAPIER-UND KARTONFABRIK),
Papier- und Kartonfabrik Ofteringen (West Germany).
H. Widmer, and O. Widmer.
Wochenblatt fuer Papierfabrikation, Vol 100, No 23/24, p 930-932, Dec 15, 1972. 2 fig.

Descriptors: *Pulp and paper industry, Water conservation, *Recirculated water, *Water reuse, *Industrial water, *Waste water treatment, *Flotation, Discharge(Water), Effluents, Equipment, Treatment facilities, Pesticides, Additives, Slime, Microorganisms, Reclaimed water, Recycling.
Identifiers: *White water, Savealls, Paper machines, Board machines, Fourdrinier machines, Cylinder (Board) machines.

A completely closed water circulation system for paper and board machines is described, based on treatment of white water in flotation savealls with addition of a nontoxic slime-control additive. Experience with this system in two fourdrinier and two combined fourdrinier/cylinder machines for production of corrugating media, coated and uncoated paperboards, and packaging papers showed it to permit machine operation with a minimum of fresh water intake and practically no effluent discharge, without any adverse effects on product quality and production rate. (Speckhard-IPC)
W74-05281

FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
W. Brecht, and H-L. Dalpke.
Wochenblatt fuer Papierfabrikation, Vol 101, No 8, p 235-241, April 30, 1973. 1 fig, 32 ref.

Descriptors: *Water reuse, *Pulp and paper industry, Water circulation, *Water conservation, Waste water(Pollution), Water pollution sources, Pollution abatement, Discharge(Water), *Economic feasibility, *Reviews, *Recycling.
Identifiers: White water, Paper machines.

A critical review of literature reporting experience with the closing or partial closing of process water circulation systems in paper mills discusses the planning and engineering stages involved in circuit closure, its advantages for pollution abatement and its disadvantages or problems. The applicability of this technique is presently still limited, but holds promise of minimizing the discharge of aqueous effluents. Total effluent elimination, e.g. by the development of 'dry' (pneumatic) and synthetic paper manufacturing processes, will not be able to fill the increasing demand for paper. (Speckhard-IPC)
W74-05282

EXPERIENCES WITH CHEMICAL PRE-PURIFICATION OF KRAFT MILL WASTE WATER WITH MAGNESIUM CHLORIDE BRINE (POTASSIUM EXTRACTION LIQUOR) (ERFAHRUNGEN BEI DER CHEMISCHEN VORREINIGUNG VON SULFATZELLSTOFFABWASSER MIT MAGNESIUMCHLORIDSOLE (KALIENDLAUGE),
VEB Zellstoff- und Papierkombinat Trebsen (East Germany).
K. Schmidt, and D. Schladebach.
Zellstoff und Papier, Vol 22, No 2, p 45-49, Feb 1973. 9 fig, 4 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Coagulation, *Chemical precipitation, *Colloids, *Dissolved solids, Magnesium compounds, Chlorides, Lime, Sedimentation rate, Sludge, Chemical oxygen demand, Pulp and paper industry, Byproducts.
Identifiers: Magnesium chloride, Wash waters.

Magnesium chloride, which is available in large amounts as a by-product of the potassium industry, can be used to precipitate colloids and dissolved solids from pulp wash waters. Sedimentation can be improved by additions of quick lime or caustic sludge. Treatment of pulp waste water with 1.4 g of magnesium chloride per liter of effluent was found to reduce the COD by ca. 30%. (Ward-IPC)
W74-05283

WOOD WASTE REUSE IN CONTROLLED RELEASE PESTICIDES,
Washington Univ., Seattle. Inst. of Forest Products.
G. G. Allan, C. S. Chopra, R. I. Gara, A. N. Neogi, and R. M. Wilkins.
Available from the National Technical Information Service as PB-222 051, $4.85 in paper copy, $1.45 in microfiche. Environmental Protection Agency report EPA 670/2-73-034, July, 1973. 86 p, 16 tab, 14 fig, 124 ref. EPA grant EC 00319/Program Element No 1D2311.

Descriptors: *Pesticides, *Herbicides, *Wood wastes, *Lignins, *Cellulose, *Pulp wastes, *Forest management, Trees, Coniferous trees, Theoretical studies, Economic feasibility, Sawdust, Agricultural chemicals, Chemicals, Solid wastes, Toxicity, Safety.
Identifiers: Lignocellulose, Agricultural wastes, 4-D (2-4-dihydroxyphenoxybutyric acid), Controlled release pesticides, Corn cobs, Bagasse, Oat hulls.

The potential utilization of large volumes of agricultural residues, lignins, and wood wastes such as bark, sawdust, corncobs, oat hulls, and sugarcane bagasse, by chemical combination with pesticides was investigated. The preparation of pesticides with prolonged effectiveness and controlled-release characteristics from lignocellulosic wastes is described, and their economics are discussed. Theories permitting the effective period of such compounds to be predicted were developed and validated. Combinations of wastes with 2,4-D (2,4-dichlorophenoxybutyric acid) were found to yield safely applicable herbicides effective in suppressing weeds and brush in the presence of conifers and in thereby substantially accelerating the growth of trees. (Brown-IPC)
W74-05286

NVENTORY OF SPRAY IRRIGATION SYSTEMS IN THE GREAT LAKES BASIN OF CANADA.
Environment Canada, Water Pollution Control Directorate, Economic and Technical Review Report EPS 3-WP-73-5, Oct. 1973. 15 p. 2 tab, 1 map.

Descriptors: *Irrigated land, *Soil disposal fields, *Waste water disposal, *Industrial wastes, Canada, *Great Lakes Region, Sprinkler irrigation, Seasonal, Winter, Irrigation, Irrigation practices, Irrigation ditches, Pulp wastes, Economic efficiency, Food processing industry, Farm management, Farm wastes, Waste disposal, Surveys.
Identifiers: Ridge and furrow disposal, Underdraining.

This government-authorized survey of industrial and sanitary effluent treatment systems using spray irrigation as partial or total disposal method included 60 industrial plant operations in Ontario, mostly farms and food processors, but also one paper mill (Strathcona Paper Co. Ltd.). The general usefulness of spray irrigation as a relatively cheap waste disposal method is emphasized. In spite of the small land area involved (ca. 2600 acres), nearly 1 billion gal of high-strength wastes are treated thus annually without major problems, such as shock loading. Sprayfield disposal is attractive to small enterprises with low capital, such as dairy and hog farms. Urban expansion and Canadian winters are the two major factors limiting more widespread use of this method. In some instances, ridge-and-furrow disposal is practiced in winter. Underdraining as a supplement to either ridge-and-furrow or spray disposal also deserves investigation, especially for industrial planning where extension of sewage facilities would cause ill-timed expenditures. Land used for irrigation is still available for later building purposes. (Brown-IPC)
W74-05288

PULP AND PAPER MILL WITH FULLY CLOSED RECIRCULATION SYSTEM -- UTOPIA OR REALISTIC POSSIBILITY. (EINE ZELLSTOFF-UND PAPIERFABRIK MIT VOLLSTAENDIG GESCHLOSSENEM KREISLAUF -- EINE UTOPIE ODER EINE REALISTISCHE MOEGLICHKEIT),
Karlstads Mekaniska Werkstad A.B. (Sweden).
L. Ranhagen.
Zellstoff und Papier, Vol 22, No 6, p 172-179, June 1973. 2 tab, 17 fig.

Descriptors: *Pulp wastes, Pulp and paper industry, *Industrial water, *Waste water treatment, *Pollution abatement, *Recirculated water, Air pollution, Water circulation, Mathematical models, Effluents, *Recycling.
Identifiers: Kraft mills.

Models are presented for various closed water systems with little or no effluent, as well as for pollution-free air systems, in an integrated kraft pulp and paper mill. It is concluded that certain combinations could make the closed system a reality for the kraft industry, not just wishful thinking. (Ward-IPC)
W74-05289

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
L. E. Pingry, and A. B. Whinston.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EEI, Proceedings paper No 10322, p 61-77, February 1974. 1 fig, 9 tab, 7 equ, 8 ref.

Descriptors: Environmental engineering, Indiana, *Water pollution control, *Alternative planning, River basins, Economics, Comprehensive planning, Temperature, Dissolved oxygen, Cost-benefit analysis, Optimization, Simulation analysis, Treatment facilities, Regional analysis, Methodology, Mathematical models, Systems analysis.
Identifiers: *Nonlinear programming, Multiobjective planning, *Cost minimization, Streeter-Phelps models, *West Fork White River(Ind.).

A methodology which takes advantage of variances in stream assimilative capacity and treats water pollution as a regional, basin-wide problem is applied to the West Fork White River in Indiana. A simulation model of river basin water quality serves as the constraint set for an optimization model that searches for the minimum cost solutions given the quality goals. Specifically, the traditional Streeter-Phelps dissolved oxygen model is integrated with a heat decay model. The resulting quality model is incorporated into a nonlinear programming river basin model which is used to calculate least-cost water treatment systems for the West Fork White River, given several alternative water quality goals. The effect of the different goals on the annual total cost of the system is examined. Special attention is focused on the possibility of relaxing the quality goals downstream from major effluent sources in exchange for increased quality upstream from these sources. The role of the planning model as an information source for decision making is examined. An appendix includes a summary of the nonlinear algorithm used and, in particular, the methods used to handle large-scale problems. (Bell-Cornell)
W74-05384

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05386

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
O. G. Lindholm.
In: Models for Environmental Pollution Control, (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 21-40 (Chapter 1), 1973.

Descriptors: *Water pollution control, *Waste water disposal, *Model studies, *Computer models, *Sewage treatment, *Networks, Hydrology, Rainfall-runoff relationships, Storm runoff, Pipes, Storage capacity, Sludge treatment, Optimization, Systems analysis, Costs, *Computer programs.
Identifiers: Gradient techniques.

Presented are four computer programs developed by the Norwegian Institute for Water Research for a total analysis and simulation of sewerage systems. The main objectives of these programs, written in FORTRAN, were to characterize wastewater flow through the various components of the sewerage system, to minimize the leakage of wastewater from the system, and to determine economically optimal systems. The four specific models that were developed are presented: (1) Wastewater and stormwater runoff model; (2) wastewater treatment plant model; (3) sludge treatment plant model; and (4) cost analysis program. The network model describes the pattern of stormwater runoff in the sewer network, determining the variation in discharge at any given point in the network for each minute of a given rainfall. Fifteen features built into the model are given. The sewage treatment plant model studies the performance of such plant receiving both sewage and rainwater runoff over a given period. The sludge treatment plant model considers: thickner, anaerobic digestion, aerobic stabilization, sludge centrifuge, sieve band press, and vacuum filters. The optimization technique used is a combination of a trial-and-error approach and a gradient method. The models may be linked together but at present most are operated independently. (Bell-Cornell)
W74-05388

REGIONAL WASTEWATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
H. H. Hahn, P. M. Meier, and H. Orth.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 41-60 (Chapter 2), 1973. 4 fig, 2 tab, 5 equ, 16 ref.

Descriptors: *Water pollution control, *Waste water(Pollution), *Treatment facilities, *Alternative planning, *Resource allocation, *Algorithms, Optimization, Methodology, Costs, Benefits, Management, Water transfer, Canals, Networks, Mathematical models, Systems analysis.
Identifiers: *Regional planning, *Branch-and-Bound strategy, *Regional water systems, Nonlinear programming, Search strategy.

There is presently a trend towards regionalization in water supply and wastewater disposal. This tendency is due to a number of factors, including increases in the cost of transporting wastewater over long distances, an increased use of surface water, and pressure from administrations to form regional systems. The individual parts of a sewerage system--interceptors, pumping stations, treatment plants--show economies of scale indicating that cost savings can be obtained through regional systems. Definite advantages and quantitative benefits are procured from planning, constructing, and operating larger plants. A mathematical formulation of the problem and an algorithm for solution are presented. The problem herein is defined by the question: which is the optimal allocation of wastewater to different wastewater treatment plants, located at different points, so that total costs minus total benefits are minimized. The problem is solved using a simultaneous technical and economic optimization. It is necessary to investigate the largest number of meaningful alternatives without excluding some solutions on the basis of engineering judgment; the best utilization of large quantities of information is warrented. A new planning approach for determination of the optimal solution is presented and applied to the above problem. This technique, the Branch-and-Bound strategy, is compared with traditional methods of regional wastewater system planning. (Bell-Cornell)
W74-05389

5E. Ultimate Disposal Of Wastes

OCEAN DUMPING IN THE NEW YORK BIGHT: AN ASSESSMENT OF ENVIRONMENTAL STUDIES,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 5C.
W74-04863

REUSE OF SOLID WASTE FROM WATER-SOFTENING PROCESSES,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-05127

RADIOLOGICAL EVALUATIONS FOR ADVANCED WASTE MANAGEMENT STUDIES,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5B.
W74-05176

REMOVAL OF RESIDUAL WASTE WATER SLUDGES (BESEITIGUNG DER RESTABWASSERSCHLAEMME),
Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany).
For primary bibliographic entry see Field 5D.
W74-05263

WHITHER CLARIFIED SLUDGE. (WOHIN MIT DEM KLAERSCHLAMM.),
R. B. Firnhaber.
Der Papiermacher, Vol 22, No 1, p 12-14, Jan. 20, 1973. 1 fig, 1 tab.

Descriptors: *Sludge disposal, *Pulp wastes, *Incineration, Fuels, Drying, Dewatering, Sludge treatment, Pulp and paper industry, *Waste disposal.
Identifiers: Furnaces.

The possibilities for disposal of clarified industrial sludges by incineration are discussed, including dewatering and drying equipment, furnace designs, and the fuel value of sedimented effluent sludges from paper mills as a function of their chemical composition. In West Germany, 18 million tons of clarifier sludge from effluent treatment are being produced annually with more than 90% water content. As was demonstrated by the city of Zurich, such sludges can be burned together with municipal refuse, provided they are first autoclaved (at 200C and 16 bar pressure) to facilitate their thickening in filter presses to ca. 45% moisture. (Speckhard-IPC)
W74-05266

RECYCLING WATER -- A SIMPLE SOLUTION,
Masonite Corp., Laurel, Miss.
For primary bibliographic entry see Field 5D.
W74-05274

WOOD WASTE REUSE IN CONTROLLED RELEASE PESTICIDES,
Washington Univ., Seattle. Inst. of Forest Products.
For primary bibliographic entry see Field 5D.
W74-05286

INVENTORY OF SPRAY IRRIGATION SYSTEMS IN THE GREAT LAKES BASIN OF CANADA.
For primary bibliographic entry see Field 5D.
W74-05288

5F. Water Treatment and Quality Alteration

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
Available from University of Illinois, Publications Office, Urbana, Ill. 61801 for $2.00. Conference conducted by Illinois Dept of Public Health and Univ of Illinois, Feb 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, August 1962. 84 p.

Descriptors: *Water treatment, *Design, *Construction, *Distribution systems, *Corrosion, Hydraulics, Sanitary engineering.
Identifiers: *Pipe materials.

Nine papers pertinent to the hydraulics, design, materials, construction, and maintenance of water distribution systems are presented. Titles are: Hydraulics of Water Distribution Systems; Applications of System Analyzers: A Summary; Pipe Materials, Coatings, and Joints for Water Distribution Systems; Water Main Laying; Tapping, Disinfection, and Inspection of Water Mains; Observing Fire Protection Requirements in Future Water System Design; Maintenance of Water Distribution Systems; Values, Hydrants, and Main Line Meters; and Domestic Service Meters. (See W74-05007 thru W74-05015) (Bean-AWWARF)
W74-05006

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
C. W. Reh.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, February 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 6-22, August 1962. 16 fig, 3 tab, 4 ref.

Descriptors: *Water distribution(Applied), *Hydraulics, *Municipal water, sMathematical models, Pipelines, Public utilities, Simulation analysis, Pipe flow, Distribution systems, Computer programs.

Methods for the analysis and design of water distribution systems are reviewed. The use of computers has facilitated this study. A program is available for balancing equivalent pipe lengths. It is feasible to consider writing a design program for a digital computer which would permit direct determination of the best combination of pipes to satisfy prescribed conditions as defined by a generalized equation. (See also W74-05006) (Knapp-USGS)
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
M. B. McPherson.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 23-44, August 1962. 11 fig, 4 tab, 48 ref.

Descriptors: *Water distribution(Applied), *Hydraulics, *Design, Analog models, Simulation analysis, Digital computers, Mathematical models, Pipelines, Public utilities, Pipe flow, Distribution systems.

The principal features, advantages, and liabilities of various devices used in calculating the hydraulic performance of water distribution system networks are outlined. With the availability of modern computing devices there is no reason for perfunctory design or arbitrary methods of analysis. A good design contains a degree of flexibility and remains a good design only so long as it is continuously reviewed, revaluated, and modified to conform with obvious departures from previous projections. The analog model is the preferred design tool for network balancing and design, and the digital computer is the preferred tool for system balancing. (See also W74-05006) (Knapp-USGS)
W74-05008

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
H. H. Benjes.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 45-49, August 1962. 18 ref.

Descriptors: *Water distribution(Applied), *Pipelines, *Pipes, *Design, Metal pipes, Concrete pipes, Joints(Connections), Plumbing.

Cast iron or asbestos-cement pipe is ordinarily used in the smaller sizes for distribution systems, although cement-protected steel pipe is generally used in certain cities in the West. Cast iron pipe is the most generally accepted type for small sizes because of its long satisfactory experience record and its ease of laying and tapping. Cast iron pipe is not suitable for some locations where soil corrosion or electrolysis is detrimental to the use of unprotected metal pipe. In these locations asbestos-cement pipe may be used. In many cities the present trend is not to use cast iron or asbestos-cement for the larger mains because of the brittleness of the materials and the consequent possibility of line breaks when subjected to soil movement, settlement, or shock loads. Asbestos-cement pipe should not be used in tight soils which are subject to shrinkage with changes in moisture content. When used in these locations, the pipe should be completely embedded in granular material. Whenever possible, all materials incorporated in a water distribution system should be selected on the basis of providing reliable service for the long-time needs of the customers served. (See also W74-05006) (Knapp-USGS)
W74-05009

WATER MAIN LAYING,
Kuch and Watson, Inc., Lake Bluff, Ill.
G. T. Watson.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 50-54, August 1962.

Descriptors: *Pipes, *Pipelines, *Construction, Design, Excavation, Distribution systems, Engineering.
Identifiers: *Water main laying.

Methods for careful and proper water main installation are briefly reviewed. Four basic products are cast iron, asbestos-cement, steel, and prestressed concrete water pipe. Basic soil conditions with which to contend in water main installation are clay, loam, peat, granular material, and rock. (See also W74-05006) (Knapp-USGS)
W74-05010

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
R. A. Wilford.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 55-59, August 1962. 6 ref.

Descriptors: *Pipes, *Pipelines, *Construction, *Disinfection, Design, Excavation, Distribution systems, Engineering, Water treatment.
Identifiers: *Tapping(Water mains).

Inspection, disinfection, and tapping of water mains are briefly reviewed. The most important thing that an inspector must watch in laying water main is the bedding conditions for the pipe. More failures occur because of poor bedding than from any other single factor. Complete disinfection of new water main can be obtained if the following measures are taken during and after installation: (1) keep the pipe reasonably clean while laying; (2) cover the end of the pipe after each day so that small animals can get in; (3) allow plenty of openings so that a velocity of 2 to 3 fps can be obtained when flushing; (4) use a chlorine dosage of at least 10 ppm and allow a contact period of 24 hours; (5) flush well before and after the contact period; and (6) test before turning into service. Tapping water mains is a relatively simple operation,and the methods used for tapping have not changed a great deal for several decades. (See also W74-05006) (Knapp-USGS)
W74-05011

OBSERVING FIRE PROTECTION REQUIREMENTS IN FUTURE WATER SYSTEM DESIGN,
Illinois Inspection Bureau, Chicago.
A. H. Gent.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 60-66, August 1962. 2 tab.

Descriptors: *Water distribution(Applied), *Pipes, *Pipelines, *Cities, Distribution systems.
Identifiers: *Fire protection(Water systems).

The fire protection aspects of several features of water supply design are briefly reviewed. Fire protection reserve provides the volume and the pressure required for public fire protection and supplies private protection facilities such as automatic sprinklers and standpipe systems. This fire reserve should be sufficient to meet the fire service requirements prescribed by the National Board of Fire Underwriters. This fire demand represents a large percentage of the total in small cities, varying from about 80% or more in cities under 5,000 to about 60% in cities of 25,000 population. (See also W74-05006) (Knapp-USGS)
W74-05012

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
J. M. Rogeven.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 67-72, August 1962.

Descriptors: *Water distribution(Applied), *Pipes, Repairing, *Maintenance, Pipelines, Distribution systems, Municipal water.

The best and most economical way to maintain a water distribution system is to have well-trained and well-paid personnel, good records, good reliable equipment, and a complete inventory of repair items. Leaks, large or small, are the most expensive and difficult maintenance jobs. There are several manufacturers of leak clamps for all of the different types of pipes and pipe joints, including a clamp which covers the entire bell. (See also W74-05006) (Knapp-USGS)
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
C. H. Ruston.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 73-78, August 1962. 2 fig.

Descriptors: *Water distribution(Applied), *Valves, *Hydrants, *Water measurement, Instrumentation, Pipes, Distribution systems, Municipal water.
Identifiers: Water meters.

Main-line or master meters provide the means of determining total flow and are the basis for accurate accounting, chemical treatment, and to determine unaccounted water. With accurate main-line meters and accurate meters at the point of consumption, the percentage of loss can be readily determined. Valves should be located uniformly throughout the system in reference to street intersections, such as on property line, curb line, sidewalk line, etc., as these help in locating valves in emergencies. In general, hydrants should be placed with consideration of their possible use as affected in the local hazards. Hose lines more than 400 to 500 feet long are inefficient and a source of delay. Therefore, hydrants should not be distributed more than 300 to 400 feet from the buildings to be protected. Furthermore, friction losses use up pressures available in hose lines at a rapid rate, and this factor definitely limits the length of hose lines. (See also W74-05006) (Knapp-USGS)
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
A. R. Moore.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 79-83, August 1962. 7 ref.

Descriptors: *Water measurement, *Instrumentation, *Water distribution(Applied), Maintenance, Distribution systems, Municipal water.
Identifiers: *Water meters.

Water meters commonly used for household, commercial, and industrial services include the positive displacement, velocity, compound, and fire line meters. Proper maintenance of water meters will pay substantial dividends. The larger meters in common use, such as 6-, 8-, and 10-inch compound or fire line meters, should be tested frequently because of the large revenue involved. (See also W74-05006) (Knapp-USGS)
W74-05015

RESERVOIR AERATION IMPROVES WATER QUALITY,
New Hampshire Water Resources Board, Concord.
D. Rapoza.
Public Works, Vol 102, No 5, p 86-87, 1971. 1 tab.

Descriptors: *Water supply, *Quality control, *Aeration, Reservoirs, Costs, New Hampshire, Destratification, Oxygenation.
Identifiers: *Greenville(N.H.), Air Aqua System.

Although New Hampshire's Greenville Reservoir was treated by flocculation, settling, rapid sand filtration, and chlorination, the water was dark from color imparted by decaying organic matter, high iron content turned laundry brown and bleaching attempts resulted in reactions with manganese, turning clothes black; in addition, there was often a strong hydrogen sulfide odor. To improve the water quality a controlled aeration system was designed to lift 150 MG of water from the bottom to the surface per day; the reservoir has a 750 MG capacity of which 213 MG is allocated for water supply. The stabilization and oxygenation effort resulted in better water quality immediately after installation of the equipment, at a cost of $8750. Shore-housed compressors pump air via a total of 4000 ft of polyethylene weighted tubing to eight individually-fed 250-ft lines of valved tubing, also of polyethylene. Air is supplied by eight 3/4-hp electric motor driven compressors. Now the town is getting excellent water in winter as well as summer. Power costs are estimated to be about $90 per month. Chemical costs before the system was installed were reduced to $39.91 per MG in August 1970. (Auen-Wisconsin)
W74-05063

SAGINAW COUNTY WATER AND WASTEWATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
For primary bibliographic entry see Field 5D.
W74-05243

INFLUENCE OF WATER INTAKE ON THE DEGREE OF INCISOR FLUOROSIS AND ON THE INCORPORATION OF FLUORIDE INTO BONES AND INCISOR TEETH OF MICE,
Institute of Dental Research, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5C.
W74-05246

5G. Water Quality Control

REMOVAL OF HEAVY METALS FROM MINE DRAINAGE BY PRECIPITATION,
Denver Univ., Colo. Dept. of Chemical Engineering and Metallurgy.
For primary bibliographic entry see Field 5D.
W74-04851

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04911

EXPRO '74--A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1974.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
November 1973. 274 p.

Descriptors: *Grants, *Projects, *Research and development, Pollution abatement, Water pollution control.
Identifiers: *Environmental protection agency, Pollution control.

This Environmental Protection Agency (EPA) Extramural Program information bulletin explains how to do business with the Office of Research and Development and provides a listing of tasks planned to be funded as research and demonstration projects during each fiscal year. The Office of Research and Development (OR and D) conducts and supports research, development and demonstration efforts on a wide variety of subjects primarily related to pollution sources and effects, environmental sciences and pollution control technology. OR and D also is responsible for assuring the quality control and standardization of analytical techniques for the Environmental Protection Agency as well as promoting, through technology transfer, the use of new techniques, processes, methodologies, etc., in pollution control. The purpose of this bulletin is twofold: (1) to acquaint the research and development community with general guidelines for working with the EPA's Office of Research and Development under grant or contract support, and (2) to make publicly available a list of specific grant and contract Tasks which OR and D plans to fund during the current Fiscal Year. This listing is planned to be issued at the beginning of each new fiscal year. (Knapp-USGS)
W74-04913

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-04981

OIL RECOVERY SYSTEM USING SORBENT MATERIAL,
Maloy Labs., Inc., Springfield, Va.
G. D. Gumtz, and T. P. Meloy.
Copy available from GPO Sup Doc as EP1.23:670/2-73-068, $4.00; microfiche from NTIS as PB-229 576 $1.45. Environmental Protection Agency, Technology Series Report, EPA-670/2-73-068, September 1973. 159 p, 20 fig, 6 tab. EPA Project 15080 HET, Contract 68-01-0068.

Descriptors: *Oil spills, Oil pollution, Recycling, *Foam separation, Separation techniques, *Pollution abatement, Ships, *Sorption, Capital costs, Operating costs.
Identifiers: *Oil recovery system, *Sorbents.

The feasibility of recovering oil in slicks 1mm and thicker by the use of recycled sorbents has been shown in laboratory and wave tank tests. Sorbents made of recticulated foam are broadcast on the sea, herded by a boom, picked up by a porous belt and the oil squeezed out of the sorbents by a wringer. The sorbents are then rebroadcast on the sea for further oil recovery. General equations were developed for basic sorption properties, sorbent broadcasting, sorbent herding, sorbent pickup, recovery of oil from the sorbent and for the total system. Based on the laboratory modeling and general equations, the total system concept was developed. It was concluded that one inch cube sorbent particles distributed in a shrouded rectilinear screw fed system was optimal. A 4/1 compression ratio of the slick by a boom herding the sorbent and oil to the channel would work under virtually any wave condition. Capital costs for this system are $216,500 and operating costs $59,500 per year. Economic studies made indicate that recovery cost is about 6 cents per gallon, assuming a system is used 22 days per year and a 20 year depreciation. For large spills the salvage cost of the oil could pay for the operation. The system has a nominal capacity of 5,000 gallons per hour. (EPA)
W74-04985

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
For primary bibliographic entry see Field 6G.
W74-04987

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W74-04988

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
For primary bibliographic entry see Field 6B.
W74-04991

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART I: ABSTRACTS.
Florida Univ., Gainesville. Coll. of Law.
Available from the National Technical Information Service as PB-222 228-Set, for $40.00 for two parts. September 1972, 809p, OWRR W-130(9075) (1).

Descriptors: *Bibliographies, *Water pollution control, *Pollution abatement, *Regulation, Legal aspects, *Abstracts, Legislation, Water law, Judicial decisions, Jurisdiction, *Water quality control, Water quality standards.

The bibliography of 2,416 abstracts includes, but is not limited to: statutes; state administrative regulations; state judicial decisions; federal statutes; federal administrative regulations; federal judicial decisions; treaties; articles and comments in serial publications; executive orders; monographs; committee reports; congressional hearings and documents; state legislative proceedings; state documents; conference reports; attorney general opinions; interstate compacts; and treaties. All abstracts appearing in the bibliography were prepared between 1968 and 1971. A majority were prepared from materials at the time; however, some documents, particularly judicial decisions, have been included regardless of their chronological date. Moreover, much of the secondary material abstracted relates to or reviews earlier concepts and enactments. All abstracts have been categorized into one of eight subject groups: Foreign and International, Federal Legislation, Federal Regulations, Federal Judicial Decisions, State Legislation, State, Regional and Local Regulations, State Judicial Decisions, and General/Interdisciplinary Analysis. Within the major subject groups abstracts have been further categorized into 42 descriptive topics. (See also W74-05005)
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART II: SUBJECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
Available from the National Technical Information Service as PB-222 228-Set for $40.00 for two parts. September 1972, 735p, OWRR W-130(9075) (2).

Descriptors: *Bibliographies, *Water pollution control, *Pollution abatement, *Regulation, Legal aspects, *Abstracts, Legislation, Water law, Judicial decisions, Jurisdiction, *Water quality control, Water quality standards.

The Subject Index lists the title and location number of an abstract under several terms describing its content. The majority of subject-index terms have been taken from the controlled vocabulary of the Water Resources Thesaurus (1st ed.), 1966, published by the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior. (See also W74-05004)
W74-05005

MAN'S ENVIRONMENT AND THE ATLANTIC ALLIANCE,
For primary bibliographic entry see Field 6G.
W74-05027

AERATION SYSTEM REVITALIZES LAKES.
For primary bibliographic entry see Field 5C.
W74-05060

RESERVOIR AERATION IMPROVES WATER QUALITY,
New Hampshire Water Resources Board, Concord.
For primary bibliographic entry see Field 5F.
W74-05063

CONTROL OF ALGAE BY MIXING,
New Hampshire Water Supply and Pollution Control Commission, Concord.
H. J. Turner, R. E. Towne, and T. P. Frost.
New England Water Works Association Journal Vol 86, No 3, p 267-275, 1972. 2 fig, 12 ref.

Descriptors: *Algal control, *Destratification, *Mixing, Methodology, New Hampshire, Cyanophyta, Chlorophyta, Eutrophication.
Identifiers: *Kezar Lake(N.H.), Aphanizomenon.

Copper sulfate controlled Anabaena successfully in Kezar Lake, New Hampshire, but in 1966 it was replaced by Aphanizomenon which proved resistant to copper sulfate. The situation was sufficiently serious to affect lake-front property values, which declined so much that assessment appraisals were reduced as much as 30%. To control the nuisance algae, an economical method was chosen as simple bubbling with air. Four air compressors were installed, each driven by a 3 h motor, on the shore with 2-inch i.d. plastic pipe leading to the deepest part of the lake (27 ft). When the compressors were started, the algal cell count was over a million per milliliter near the surface and there was practically no oxygen near the bottom; the Secchi disc reading was 1-1/2 feet. After a month of bubbling, algal cell counts dropped below 30,000 cells/ml and Secchi disc readings increased to over 3-1/2 feet. Algal composition changed from blue-greens to the less objectionable greens and Secchi disc reading remained in excess of four feet. Observations suggest that mixing may accelerate algal succession and that destratification may have a beneficial long-term effect on a lake. (Jones-Wisconsin)
W74-05064

EFFECT OF WATERSHED AREA OIL FIELD ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
For primary bibliographic entry see Field 5B.
W74-05079

REPORT OF THE POLLUTION COMMISSION PART II: COLLABORATION BETWEEN THE WATER AND OIL INDUSTRIES,
For primary bibliographic entry see Field 5B.
W74-05094

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
For primary bibliographic entry see Field 5B.
W74-05100

ABATEMENT OF MINE DRAINAGE POLLUTION BY UNDERGROUND PRECIPITATION
Parsons (Ralph M.) Co., Los Angeles, Calif.
C. K. Stoddard.
Copy available from GPO Sup Doc as EP1.23:670/2-73-092, $1.55; microfiche from N

s PB-229 407 $1.45. Environmental Protection
gency, Technology Series Report EPA-670/2-73-
92, October 1973. 125 p, 16 fig, 8 tab, 5 ref. EPA
roject 14010 EJF (No CR84). Contract WPRD-
42-01 to Pennsylvania Dept. of Environmental
esources.

escriptors: *Acid mine water, *Mine water,
eutralization, Water pollution, Flow control,
Sealants, *Coal mine wastes, *Pennsylvania,
Slurries, Lime, Pollution abatement, Mine
rainage.

aboratory tests with synthetic acid mine water
ow the sealing effect of the gelatinous
recipitate that forms when hydrated lime or pow-
ered limestone is added in a simulated mine entry
osed by a porous barrier. Field tests were con-
ucted in a recently abandoned coal mine.
ydrated lime and limestone slurries were
umped into the mine water behind rubble barriers
rough 2-inch steel pipes to test the laboratory
ndings. The outflow was observed at weirs at-
ched to the ends of two 12-inch diameter drain
pes. The results indicated that only temporary
aling of the outflow was achieved and that
eutralization took place when the interior water
ow conditions were favorable. Placement of the
jection outlets, dispersion of the lime slurry,
olume of water flowing, and direction of flow in
e mine interior to other outlets are important
ntrolling variables that greatly affect the effi-
ency of the sealing and neutralization of the out-
owing acid mine water. (EPA)
/74-05106

**NTERSTATE PLANNING FOR REGIONAL
/ATER SUPPLY AND POLLUTION CONTROL.**
/eston (Roy F.), Inc., West Chester, Pa.
or primary bibliographic entry see Field 5D.
/74-05108

**OMBINED SEWER OVERFLOW FOR THE
UDSON RIVER CONFERENCE,**
nterstate Sanitation Commission, New York.
or primary bibliographic entry see Field 5D.
/74-05112

**ENERAL ENVIRONMENTAL SITING GUIDES
OR NUCLEAR POWER PLANTS -- TOPICS
ND BASES, (DRAFT).**
irectorate of Regulatory Standards (AEC),
/ashington, D.C.
ctober 31, 1973. 130 p, 12 fig, 179 ref.

escriptors: *Nuclear powerplants, *Sites, Loca-
ons, *Regulation, *Environment, *Safety,
cology, Soils, Geology, Climatology, Hydrology,
ublic health, Population, *Water pollution con-
ol, Water supply.

he development of general environmental siting
uides for nuclear powerplants is one of the steps
eing taken by the United States Atomic Energy
ommission to improve the selection of environ-
entally acceptable sites and to shorten the
verall licensing process for light-water reactors.
he guides must be based on sound principles of
nvironment management and should be a max-
num use to industry and the concerned public in
valuating and improving conventional siting prac-
ces. The guides should also be of general value
r assessing the desirability and practicality of ad-
anced siting concepts such as nuclear power
arks, offshore and lagoon sites for floating
ants, and underground and metropolitan sites.
Houser-ORNL)
/74-05180

**EC IMPLEMENTATION OF THE NATIONAL
NVIRONMENTAL POLICY ACT IN ITS
ICENSING AND REGULATION OF NUCLEAR
ACILITIES,**
ivision of Radiological and Environmental Pro-
ction (AEC), Washington, D.C.
L. R. Rogers, and C. L. Henderson.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 63-67. (1971).

Descriptors: *Law enforcement, *Legislation, Management, *Legal aspects, *Regulation, *Administration, Administrative agencies, *Standards, Safety, Population, Public health, Environment, Radiation, Water, Water quality, Air, Soils, Organizations.
Identifiers: *National Environmental Policy Act.

In response to growing public awareness and concern for protection of the natural environment, the federal government enacted on January 1, 1970, the most comprehensive and far reaching of the several federal statutes directed specifically toward the protection of the environment. The statute is known as the National Environmental Policy Act of 1969, or NEPA. Broadly speaking, the Act makes it the continuing responsibility of the federal government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate federal plans, functions, programs, and resources toward certain stated ends of environmental protection. An AEC policy statement for implementing NEPA is discussed. One of the underlying themes in the new policy statement is that the preservation of environmental values can best be accomplished through the establishment of environmental quality standards and requirements by appropriate federal, state, and regional agencies having responsibility for environmental protection, and the AEC urges that these agencies proceed promptly to establish such standards. A draft of 'Guide to the Preparation of Environmental Reports for Nuclear Power Plants' has been prepared and issued for comment and interim use. (See also W74-05181) (Houser-ORNL)
W74-05186

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
For primary bibliographic entry see Field 6F.
W74-05234

SLOW RELEASING NITROGEN FERTILIZER FROM THE WASTE PRODUCT, LIGNIN SULPHONATES,
Forschungsanstalt fuer Landwirtschaft, Brunswick (West Germany). Institut fuer Biochemie des Bodens.
For primary bibliographic entry see Field 5B.
W74-05249

NEW MEASURING METHODS FOR EVALUATING WASTE WATER QUALITY (NEUERE MESSVERFAHREN ZUR BEURTEILUNG DER ABWASSERQUALITAET),
Herzberger Papierfabrik Ludwig Osthushenrich K.G., Herzberg am Harz (West Germany).
For primary bibliographic entry see Field 5A.
W74-05259

SURVEY OF RESIDUAL WASTE WATER TREATMENT (UEBERBLICK UEBER DIE BEHANDLUNG DER RESTABWAESSER),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungesstelle.
For primary bibliographic entry see Field 5D.
W74-05261

ECONOMIC IMPACT OF POLLUTION ABATEMENT ON THE SULFITE SEGMENT OF THE U.S. PULP AND PAPER INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W74-05277

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5B.
W74-05285

RELIABILITY AND ECONOMIC OPTIMIZATION FOR URBAN RETURN FLOWS MANAGEMENT,
Texas Univ., San Antonio. Div. of Environmental Studies.
For primary bibliographic entry see Field 5B.
W74-05333

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
For primary bibliographic entry see Field 5C.
W74-05357

THE USE OF MINERAL FERTILIZERS IN IRRIGATION WITH PURE WATER, SEWAGE AND LIQUID MANURE, (IN RUSSIAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Leipzig (East Germany). Institut fuer Mineraldueng.
For primary bibliographic entry see Field 3F.
W74-05371

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W74-05384

SYSTEMS ANALYSIS FOR ENVIRONMENTAL POLLUTION CONTROL,
Michigan Univ., Ann Arbor. School of Public Health.
R. A. Deininger.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, p 3-18 (Introduction), 1973. 88 ref.

Descriptors: *Systems analysis, *Mathematical models, *Environmental control, *Water pollution control, *Pollution abatement, Solid wastes, Disposal, Air pollution, Optimization, Simulation analysis, Stochastic processes, Digital computers.

In this introductory chapter, Deininger discusses the use of systems analysis and mathematical modeling for formulating and solving problems of environmental pollution. He defines the systems approach and considers seven standard steps in a systems analysis study. They include: (1) problem formulation; (2) model construction; (3) definition of criterion function; (4) data collection; (5) derivation of optimal solutions; (6) model, solution, and sensitivity testing; and (7) implementation of the best solution. Next, Deininger acknowledges the techniques and tools of systems analysis, i.e., optimization; linear, non-linear, and dynamic programming; stochastic and integer programming; queueing theory; simulation and network techniques; PERT, CPM; gradient techniques; and digital computers. This paper then examines water pollution problems--with special attention paid to the historic development of the use of systems analysis--then solid waste disposal problems, and then air pollution problems. Finally, Deininger looks at total and global environmental models and summarizes current modeling efforts. (Bell-Cornell)
W74-05387

A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,
Purdue Univ., Lafayette, Ind., Dept. of Economics.

For primary bibliographic entry see Field 5B.
W74-05390

INTRODUCTION TO SIMULATION TECHNIQUES,
California Univ., Davis. Dept. of Civil Engineering.
G. T. Orlob.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 91-105 (Chapter 4), 1973. 5 fig, 10 equ, 11 ref.

Descriptors: *Simulation analysis, *Aquatic environment, *Water pollution control, *Planning, *Methodology, River basins, Estuaries, Reservoirs, Mathematical models, Hydrology, Systems analysis.

A basic approach to simulation of the aquatic environment that has proven to be practical in pollution control planning is outlined in detail. There are three fundamental steps in model design: conceptual, functional, and computational representation. A discussion of the first two steps serves to illustrate the model development procedure, the third step being out of the scope of this paper. Under conceptual representation, determining model scale and discretizing the system are considered. Within the functional representation, advection-diffusion equations, the effects of scale, mass conservation equations, and motion and continuity are discussed. (Computational representation includes selecting a solution technique and forming input and output.) Included as illustrative examples in this simulation study are the Texas Water Plan, model idealization of a river basin, conceptual representation of a reservoir, and the San Francisco Bay-Delta estuarial mathematical model network, including a definition sketch--WRE node-link estuarial model. Following this approach, useful models have been developed for many classes of problems and are now being applied in planning studies in the United States. Among those that may be cited are models for: stream water quality; reservoir temperature; estuarial hydrodynamics and quality; groundwater quality; and aquatic ecology. (Bell-Cornell)
W74-05391

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
W. O. Spofford, Jr.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 403-436 (Chapter 19), 1973. 2 fig, 1 tab, 36 equ, 49 ref.

Descriptors: Environment, *Quality control, *Management, *Model studies, *Water quality, *Wastes, Air pollution, Waste disposal, Regions, Systems analysis, Optimization, Simulation analysis.
Identifiers: Residuals management, *Environmental quality, Nonlinear programming.

The effort to integrate models of air and water pollution and solid waste disposal into an overall environmental quality model is described. The term 'total environmental quality management models' is defined as meaning 'regional residuals-environmental quality management models,' where these include only the impacts on environmental quality of residuals discharges to the air, water, and land environments. The term 'residual' is preferred here to that of 'waste.' The entire regional residuals management system is delineated, including the range of management options available to society for improving environmental quality; indicated is how all the system components may be expressed and ultimately linked together within the same computational framework. The residuals management model is discussed qualitatively and then formulated quantitatively; mathematical forms of the various environmental models are discussed, and computational schemes for selecting an optimal management strategy are suggested. Included are: residuals generation and discharge models; environmental modification and environmental quality models; a management model formulation and a procedure for optimizing a nonlinear objective function subject to a set of linear constraints; an atmospheric dispersion model; an aquatic ecosystem model; and more optimization procedures, including a heuristic approach. The regional residuals management model suggested herein is more complex than the classical management model approach, and it requires a substantial amount of computer resources. (Bell-Cornell)
W74-05398

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 4A.
W74-04852

OPTIMIZATION OF OPERATION OF A SYSTEM OF FLOOD CONTROL RESERVOIRS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-04858

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W74-04860

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W74-04918

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 7C.
W74-04924

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W74-04984

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W74-04988

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
For primary bibliographic entry see Field 4A.
W74-04997

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
For primary bibliographic entry see Field 4A.
W74-04999

OPTIMAL STATE ANALYSIS OF RESERVOIRS,
California Univ., Los Angeles. School of Engineering and Applied Sciences.
W. W-G. Yeh, L. Becker, W. J. Trott, G. W. Tauxe, and L. F. Hancock.
Report UCLA-ENG-7390, November 1973. 75 p, fig, 2 tab, 17 ref, 2 append. USDI Contract 14-06-200-5882A.

Descriptors: *Reservoir operation, *Optimization, Dynamic programming, California, Linear programming, Least squares method, Streamflow forecasting, Bibliographies, Abstracts, Systems analysis, Water management(Applied).
Identifiers: *California Central Valley Project.

Dynamic programming was studied for use in selection of an optimal reservoir storage policy path through a specified number of policy periods and linear programming for use in period by period optimization. The policy periods, in case of the real time operation, correspond to the number of time periods for which a streamflow prediction model is reasonably reliable. The method results in relatively easy computer implementation and high flexibility, in that changes in constraints are simply made and additional reservoirs easily added. The method is useful for the determination of release policies in real time operation of an existing system. The methods are demonstrated in a real system of reservoirs and hydroelectric facilities associated with the Shasta, Trinity and Folsom subsystems of the California Central Valley Project. The two-stage least squares estimation method gives unbiased estimators when the system is described by a set of simultaneous equations in which each equation contains several dependent variables, which also occur in other equations. In Shasta and Clair Engle reservoirs, California, the dependent variables are the February to July inflows while the independent variables include snow-water contents and precipitation indices at several stations within the two watersheds. An annotated bibliography was compiled of the available practical techniques for considering the adverse effects of daily and weekly operations on the risk of not meeting firm water and power commitments at some future date. (Knapp-USGS)
W74-05167

SYSTEMS ANALYSIS: A DECISION-MAKING TOOL FOR ARID LAND DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 268-277. 2 tab

Descriptors: *Land development, *Decision making, *Operations research, *Systems analysis, *Arid lands, Agriculture, Land management, Land use, Management, Planning, Alternate planning, Optimization, Risks, Scheduling, Simulation analysis, Hydrologic systems, Model studies.

Arid land development is an integral part of water resources development planning, entailing the selection of certain alternate procedures in light of a given set of parameters. The selection process may be facilitated by using operations research, systems analysis or decision analysis as a tool. Examples of such use are illustrated by a watershed problem, where plans to induce runoff need to be studied for their effects, and an agricultural problem with irrigation scheduling constraints. The techniques involved are still relatively new, leaving to the ingenuity of the planner a key part in the decision process. The systems analyst may make the decision-making process easier by showing the

sults of each alternative choice as it relates to e solution of the given problem and to products of the decision. (Muller-Arizona)
74-05223

LIABILITY AND ECONOMIC OPTIMIZA-ON FOR URBAN RETURN FLOWS ANAGEMENT,
xas Univ., San Antonio. Div. of Environmental dies.
r primary bibliographic entry see Field 5B.
74-05333

UIVALENT PIPE METHODS FOR OPTIMIZ-G WATER NETWORKS--FACTS AND FAL-CIES,
orkee Univ. (India).
r primary bibliographic entry see Field 8A.
74-05383

PLICATION OF MULTIGOAL WATER ALITY PLANNING MODEL,
nnert Graduate School of Industrial Adminis-ion Administration, Lafayette, Ind.
primary bibliographic entry see Field 5D.
4-05384

E ECONOMIC EFFICIENCY OF INTER-SIN AGRICULTURAL WATER TRANSFERS UTAH: A MATHEMATICAL PRO-AMMING APPROACH,
ter Research Lab., Logan.
primary bibliographic entry see Field 4A.
4-05385

DELS FOR ENVIRONMENTAL POLLU-N CONTROL.
higan Univ., Ann Arbor. School of Public lth.
primary bibliographic entry see Field 5B.
4-05386

TEMS ANALYSIS FOR ENVIRONMENTAL LLUTION CONTROL,
higan Univ., Ann Arbor. School of Public lth.
primary bibliographic entry see Field 5G.
4-05387

IONAL WASTEWATER MANAGEMENT TEMS,
lsruhe Univ. (West Germany). Institut fuer llungswasserwirtschaft.
primary bibliographic entry see Field 5D.
4-05389

REGIONAL PLANNING MODEL FOR TER QUALITY CONTROL,
lue Univ., Lafayette, Ind., Dept. of nomics.
primary bibliographic entry see Field 5B.
-05390

RODUCTION TO SIMULATION HNIQUES,
fornia Univ., Davis. Dept. of Civil Engineer-

primary bibliographic entry see Field 5G.
-05391

THEMATICAL MODEL FOR OXYGEN ANCE IN RIVERS,
ete Grenobloise d'Etude et d'Applications rauliques (France).
primary bibliographic entry see Field 5B.
-05392

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5B.
W74-05393

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 4A.
W74-05394

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
W. Schmid, G. Kuhlmann, and J. Muhlbauer.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 181-196 (Chapter 8), 1973. 4 fig, 3 tab.

Descriptors: Water resources development, *Water users, *Weirs, *Canals, Construction, *Cost-benefit analysis, *Simulation analysis, *Water supply, Rivers, Reservoirs, Water quantity, Water quality, Navigation, Computer programs, Investment, Pricing, Mathematical models, Systems analysis.
Identifiers: *Economic analysis, Receiving water capacity.

An approach is presented for determining the net benefits accruing to urban, industrial, and agricultural water users from the construction of weirs and canals for navigation purposes. Included is an economic appraisal of changes in water use caused by such investment. Canals and weirs influence the water supply and receiving water capacity of a channel-reservoir system; the major consequences of such construction are alterations of water supply in quantitative and in qualitative terms and an alteration of the receiving water capacity. These alterations affect water utilization (except when they occur within the range of excessive quantity or quality) and are economically relevant in the form of costs and benefits. The approach presented combines cost-benefit analysis and a five-element simulation model to derive the physical benefits accruing to water users. On the basis of this model, a computer program was developed that was tested for two sections of the German system of domestic waterways. The next step is to develop a general model for transforming the net benefits in physical terms into net monetary benefits. Thus far, only the basic pricing concept has been developed, which is based upon an opportunity cost approach. (Bell-Cornell)
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
For primary bibliographic entry see Field 6B.
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
M. Benedini.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 205-215 (Chapter 10), 1973.

Descriptors: Water resources development, *Management, *Water supply, *Hydroelectric power, *Simulation analysis, *Irrigation, *Water demand, *Water quality control, *Reservoirs, Seasonal, Dams, Downstream, Reach(Streams), Flow, Optimization, Mathematical models, Systems analysis.
Identifiers: *Italy(Tiber River).

The principle aspects of water resources management in Italy are discussed, and simulation and optimization techniques applied to existing problems are described; there is an increasing demand (in the face of scarce supplies) for domestic, irrigation, and industrial water, with the need for increasing the individual income. Needed also are large treatment plants for the reuse of wastewaters. But management of Italian water resources now consists mainly of settling conflicts between existing uses, rather than planning new hydraulic works. Hydroelectric power production suffers from limitations imposed by flood control needs. Described is a simulation model, based on a continuity equation, which can be used with both historical and synthetic hydrological input, as well as in a deterministic and probabilistic manner. Difficulties of mathematical and economic evaluation of water uses in Italy are considered. Problems of irrigation water demand, water supply, pollution, and water quality are discussed, considering the application of optimization and simulation modeling. Finally, the work of the 'Istituto di Ricerca sulle Acque' in developing methodologies for studying integrated utilization of the resources in a large catchment area is reported. The area chosen for study was that of the Tiber River. (Bell-Cornell)
W74-05397

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

6B. Evaluation Process

THE IDENTIFICATION AND QUANTIFICATION OF THE NET EFFECTS OF MULTIPLE-PURPOSE RIVER BASIN DEVELOPMENT,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 4A.
W74-04854

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
For primary bibliographic entry see Field 8A.
W74-04856

WATER QUALITY IN ALASKAN CAMPGROUNDS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W74-04974

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
For primary bibliographic entry see Field 6G.
W74-04987

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
J. Tourbier.
Available from the National Technical Information Service as PB-228 853, $13.75 in paper copy, $1.45 in microfiche. Final Report. April 1973. 199 p, 34 fig, 5 append. OWRR C-2185(3382) (1).

Descriptors: *Comprehensive planning, Water resources development, *Model studies, *Land use, *Urban hydrology, Surface waters, Subsur-

face waters, Percolation, Permeability, Urbanization, Land classification, *Delaware, Systems analysis, Planning.
Identifiers: Urban water resources protection, *Christina River Basin(Delaware), *Environmental protection measures, Land use policy, Non-point source pollution.

The Christina River Basin near Wilmington, Delaware was used as a model area to determine methods that could be used by the public sector through its planning and regulatory powers to first assess the impact of land development upon water resources and certain hydrologic phenomena and then to create a responsive land use policy and program. The impact of urban development on the natural pattern of water flow is a function of 2 sets of variables, the natural characteristics of the land and the type and intensity of development. Land areas were classified into categories called site classes on the basis of the properties that influenced the water regimen. Land uses were described in terms of their water-related impact. A computer program then related environmental protection measures, measures that can be incorporated into development while it proceeds, to the variables of site class and land use intensity. The cost distribution of these measures was used to evaluate regional land use policies and to indicate areas of natural resources limitations to development, to allow for guidance of land uses to areas where they would do the least damage. The program is heavily reliant on protection measures and their cost as an indication of problem areas. The selection of measures requires an assessment of the impact of land uses on hydrologic processes, a definition of levels of quality to be achieved, and the quantification of amelioration measures. The costing of protection measures requires specifications for construction. (Hoffman-North Carolina)
W74-04988

NORTH CAROLINA WATER PLAN-PROGRESS REPORT-CHAPTER 22, WATER BASED RECREATION.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Office of Water and Air Resources.
Draft. April 1973. 182 p, 8 fig, 36 tab, 182 ref, 4 append. Title III PL 89-80. Water Res. Plan. Act 1965.

Descriptors: Recreation, *Recreational demand, *Recreation facilities, *Water demand, *North Carolina, Water sports, Bodies of water, Economics, Land use, Natural resources, Water management, Reservoirs, Lakes, Environment, Water resources, Model studies, Rivers.
Identifiers: *Leisure, Recreation resource base, Simulation.

Demand for outdoor recreational facilities is increasing due to higher family income, increased mobility, leisure time, and population. North Carolina, with its varied water resources, provides recreational opportunities. A North Carolina comprehensive outdoor recreation plan recommends providing outdoor opportunities, preserving recreational areas, and achieving these functions in the best way. Recreational demand is concentrated primarily along the Piedmont Crescent. While an adequate recreational resource base is needed, distribution of bases in relation to population centers is also needed, as is quality of the base and time period when the resource is used. This study attempts to simulate visitation patterns around major lakes and reservoirs. It is estimated that 70% of visitors are from North Carolina. It also found that some areas with high recreational demand have few recreational opportunities. Federal attempts in recreational development, such as the National Park System, are discussed, as are lakeshore development, economic consideration, and other related topics. Recommendations presented include increasing public access to recreational areas, preserving natural resources, and balancing water-based recreational planning. Tables detailing recreational areas, (i.e. inland water bodies, farm ponds, fishing streams, coastal beaches) a description of simulation model utilized and a brief description of federal programs concerned with recreation are in the appendices. (Grden-North Carolina)
W74-04990

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
Final report. June, 1973. 250 p, 59 tab, 2 append. ALA-RX09-1020-0.

Descriptors: *Comprehensive planning, *Water management(Applied), *Drainage programs, *Water supply, Sewage, *Sewage treatment, Programs, Water, Water pollution control, Environmental effects, Channel improvement, *Alabama, *Community development.
Identifiers: Prattville(Ala.), Augusta Creek(Ala.), Alabama River.

Between 1963 and 1973 the population of Prattville grew by 98%. This growth is expected to continue, although at a declining rate of 5% per year. The comprehensive community development plan was undertaken to provide a framework for the future development of the Prattville urban community systems of land use, streets and highways, community utilities, community facilities, and public improvements. Recommendations are based upon interrelationships between subsystems of these systems. It is recommended that Prattville continue to draw upon underground wells for its drinking water supply. The water is of good quality; pollution of ground water supplies should not be a problem due to their depth and the natural purification from percolation. The storm drainage plan, based on 25 year storm data, proposes to utilize natural drainage courses, which to ensure continuation of natural stream life, will not be lined with concrete. A mandatory land dedication policy for drainageways also proposed. Sewage treatment capacity, under the plan, will be increased, not only to provide secondary treatment but also to eliminate the overflow of raw sewage presently being discharged into Augusta Creek. An interim plan for water pollution control abatement in Augusta Creek and the Alabama River is included. (Hoffman-North Carolina)
W74-04991

STATUS OF STATE COASTAL ZONE MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administration, Washington, D.C. Coastal Zone Management Task Force.
For primary bibliographic entry see Field 2L.
W74-04995

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
For primary bibliographic entry see Field 4A.
W74-04999

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05001

RECREATION IN THE OPEN AIR,
Netherlands Universities Foundation for International Co-Operation, The Hague.
P. Loos.
Planning and Development in the Netherlanc
Vol 4, No 1, p 107-122, 1970. 3 fig, 2 tab, 5 photo

Descriptors: *Land reclamation, *Reclamatic
Recreation, Land use, *Dikes, *Recreation fac
ties, Soil environment, Beaches, Soil typ
Vegetation establishment, Soil structure, Wa
policy, Landscaping, Soil management, La
management.
Identifiers: *Netherlands(Ijsselmeer polder
*Oostelijk Flevoland(Neth), Polders, Aqua
sports areas, Sojourn accomodations, Nature t
rains, Open space, Oecological Reserve.

Recreation is an important component of the w
of life in the Netherlands due to a rise in prosp
ty, shorter working hours, an increase of auton
bile use, and higher education levels. A recreat
plan for Oostelijk Flevoland, a polder reclaim
from the sea, is based upon dike delineation, la
scape design, recreational needs, and soil typ
This plan includes aquatic sports areas, shores
beaches, woods, planted areas, nature terra
sojourn accommodations, and special points of
traction. A chain of border lakes has been crea
between the polders and the mainland offe
many aquatic sports. Beaches have b
developed along the dikes, together with
sewerage system to keep the water clean. Plan
and wooded areas integrate agricultural
recreational areas. Meadow bird reserves, wh
the ground water has been artifically raised, f
ing places, and the Oecological Reserve for stu
ing the natural succession of plant and animal
have been created. Other special attractions
clude an agricultural exhibition, game parks
hoofed animals, and a museum depicting the hi
ry of land reclamation in the Netherlands. W
this recreation plan, the Oostelijk Flevoland ho
to enhance the Dutch way of life. (Grden-N
Carolina)
W74-05003

CALIFORNIA UNDERSEA AQUEDU RECONNAISSANCE: THE OCEANOGRA (CUARO),
Naval Undersea Center, San Diego, Calif.
R. H. Riffenburgh.
Available from NTIS as AD-768 730, $5.7
paper copy. Report No NUC TP 353, August 1
158 p, 41 fig, 10 tab, 36 ref.

Descriptors: California, *Aqueducts, Underwa
Waves(Water), Surges, Tsunamis, Den
Coastal engineering, Freshwater, Oceanograp
Identifiers: California Undersea Aqueduct.

The possibility is discussed of conveying f
water from northern to southern California
subsurface offshore aqueduct (The California
dersea Aqueduct). The specific region investig
was between Crescent City and San Diego
the 20- to 200-m depth contour. Available dat
relevant variables were analyzed to provide i
mation for aqueduct planning decisions. The v
bles and analyses most influential in planning
California Undersea Aqueduct were divided
two categories: variables influencing the 100-
survival of the aqueduct (century risks) and v
bles influencing the construction and mainten
of the aqueduct. Waves, surges, tsunamis, d
ty, and light do not appear on the basis of re
naissance data to pose insurmountable probl
Surface, water column, and bottom currents
cluding upwelling and internal wave phenom
may or may not be prohibitive; data ar
adequate, and additional information must b
tained from in situ observations. Canyons ar
an insurmountable threat, but will pose innov
engineering challenges and probably be quit
pensive. Additional data will also be require
these processes. (Sinha - OEIS)
W74-05040

ITERSTATE PLANNING FOR REGIONAL
ATER SUPPLY AND POLLUTION CONTROL.
eston (Roy F.), Inc., West Chester, Pa.
or primary bibliographic entry see Field 5D.
74-05108

CONOMIC, SOCIAL AND ENVIRONMENTAL
IPACTS OF PUBLIC WORKS, VOL. I PITT-
URGH AREA STUDIES, VOL. II. THE
LEGHENY COUNTY SANITARY AUTHORITY
LCOSAN) FACILITY, VOL. III. IMPACT
NALYSIS,
tsburgh Univ., Pa. Environmental Engineering
ogram.
L. Garrison, R. Brumbaugh, B. Hillegas, and
Rowe.
nerican Society of Civil Engineers, New York,
w York, August 1972. 226 p, 24 fig, 38 tab, 336
. NSF: GI-29980.

scriptors: *Project post-evaluation, *Social im-
ct, *Economic impact, *Sewerage, *Waste
ter disposal, *Civil engineering, Sewage dis-
cts, Urban sociology, Methodology, Assess-
nts, Evaluation, History, Forecasting, Project
nning, Project benefits.
ntifiers: *Impact analysis, *Impact statements.

e development and operations were studied of
Allegheny County Sanitary Authority which
vides sewerage and sewage disposal services
72 communities in Allegheny County, Pennsyl-
ia. The purpose was to identify and assess the
ial, economic and physical impacts attributable
he program and facilities of the Authority from
date of its inception. The overall objective was
develop study methods and techniques for im-
t analysis of various kinds of civil engineering
grams and projects. This study was one part of
search project of the American Society of Civil
gineers titled 'Impact of Civil Engineering Pro-
s on People and Nature'. The ASCE research
ject involved several studies all of which were
used on the development of a methodology for
act analysis. The ultimate usefulness of the
lts of this and subsequent studies that are
ned by the ASCE will be in predicting the
bable impacts of proposed civil engineering
jects prior to their final design, construction
implementation. Recommendations are given
making additional studies of the Sanitary
hority. Other completed civil engineering pro-
s located in the Pittsburgh area, and thought to
ood subjects for impact study, are identified.
eneral discussion of impact analysis and study
hodologies is included. (Poertner)
4-05231

VELOPMENT OF WATER FACILITIES--
OOME COUNTY, 1967-2017.
tin (R. J.) and V. O. Shumaker-Joint Venture,
tal, N.Y.
nty of Broome, New York, 1967. 11 p, 2 fig, 1
CPWS-8.

criptors: *Water supply, *Long-term planning,
ter districts, *New York, *Local govern-
ts, Public utility districts, Public benefits,
er rates, Regional development.
tifiers: *Broome County(New York).

43 existing separate public water systems in
County should be consolidated into one Part-
nty Water District. The single district would
rporate the water systems of the City of
hamton, the Villages of Endicott and Johnson
, and the Towns of Binghamton, Chenango,
klin, Dickinson, Fenton, Kirkwood, Maine,
n, Vestal, and Windsor. The general outline
e proposed district is shown. The forming of
water agency would eliminate all of the weak-
es that abound when there are 43 neighboring
ms going their separate ways. The 43 systems
have available as much water as will be
ed in 2017. While the cost of almost
ything will multiply, the cost of water in 2017
need be no higher than it was in 1967. The establishment of a single water agency would save time, money, man-power, machines and materials plus intergovernmental paper-work and delay for all concerned. Every consumer in the new water union would immediately achieve fair and equal status. The person in dire need of water would be spared the long and arduous process of petition and public hearing before his town board. In some existing cases, even more time is lost because the town board has to petition a second municipality to provide water service. A description of the proposed water agency, customer charges, and a listing of advantages and specific recommendations are included. (Poertner)
W74-05232

SEWERAGE FEASIBILITY STUDY, BROOME COUNTY, NEW YORK, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.
Clinton Bogert Associates, Fort Lee, N.J.
For primary bibliographic entry see Field 5D.
W74-05233

SEWAGE COLLECTION AND TREATMENT SYSTEMS: ISSUES IN AND APPROACHES TO IMPACT ANALYSIS,
Pittsburgh Univ., Pa. Environmental Engineering Program.
W. L. Garrison, R. Brumbaugh, B. Hillegas, and M. Rowe.
American Society of Civil Engineers, New York, New York, August 1972. 38 p, 13 fig, 4 ref. NSF Grant no. GI-29980.

Descriptors: *Project post evaluation, *Civil engineering, *Social impact, *Economic impact, *Sewerage, *Sewage districts, Urban sociology, Methodology, Waste water disposal, Assessments, Pennsylvania.
Identifiers: *Impact analysis, Pittsburgh.

An overview is given of the principal issues encountered during a study of the impacts of the regional sewage collection and treatment system serving the Greater Pittsburgh Area. This study was one part of a research project of the American Society of Civil Engineers titled 'Impact of Civil Engineering Projects on People and Nature'. The purpose of the ASCE study was to identify and study the impacts of several real-world civil engineering projects and programs. The ASCE envisions that, through subsequent planned studies, a methodology can be developed that will aid planners, designers and public officials to predict the probable impacts of civil engineering projects and programs far in advance of development and implementation. The subject of this report is the Allegheny County Sanitary Authority which serves about 1.2 million people in Allegheny County, Pennsylvania. The approaches used and the issues that guided the study and emerged from the study are discussed. The various impacts investigated included upstream impacts, downstream impacts and treatment plant impacts. Investigations undertaken included study of social, economic, political and physical impacts attributable to the development and operation of the Allegheny County Sanitary Authority. Additional studies are needed to identify and analyze the impacts of the Authority to aid in the development of study methodology for analyzing impacts of other types of civil engineering projects. (Poertner)
W74-05241

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3A.
W74-05382

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
For primary bibliographic entry see Field 6A.
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
Y. Emsellem.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 197-204 (Chapter 9), 1973.

Descriptors: Water resources development, *Management, *Water supply, Methodology, *Regional analysis, *Comprehensive planning, *Political aspects, Social aspects, Hydrologic aspects, Economics, *River basin development, Cost-benefit analysis, Simulation analysis, Forecasting, Agriculture, Mathematical models, Systems analysis.
Identifiers: *France.

An approach to water resources management is presented which abandons traditional mathematical programming with a unique objective function for a more highly comprehensive procedure. The complete hydrological basin from the source to the sea should be accepted as the basic geographical unit since it is usually an administrative and political unit. When a basin water supply manager hears that water is needed to irrigate an additional million acres, the question is not how to minimize the cost and optimize the benefit, but rather, politically-based, why another million acres should be irrigated. Possible answers are: to produce agricultural goods for domestic consumption; (2) to sell these products abroad; or (3) to create a need for labor. The distribution of charges between activity and group is different from one case to another. The inadequacy of cost-benefit analysis is discussed. A methodology for river basin development being used in France is described. A basic principle is that future water needs depend on the perspectives of regional development (determining economic and social perspectives on the basis of optimum valorization of water resources is possible only when water is scarce, as in arid zones). Four phases of the methodology are distinguished: (1) hypothesis for basin development; (2) forecast model; (3) simulation model; and (4) finance model (evaluates overall cost of each of the preceding solutions). (Bell-Cornell)
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 6A.
W74-05397

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

OIL RECOVERY SYSTEM USING SORBENT MATERIAL,
Maloy Labs., Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W74-04985

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

WELL COST ANALYSIS,
National Water Well Association, Houston, Tex. Research Facility.
For primary bibliographic entry see Field 8B.
W74-05091

AIR FLOTATION-BIOLOGICAL OXIDATION OF SYNTHETIC RUBBER AND LATEX WASTE-WATER,
Firestone Synthetic Rubber and Latex Co., Lake Charles, La.
For primary bibliographic entry see Field 5D.
W74-05105

HOW MUCH WILL CLEANUP COST,
For primary bibliographic entry see Field 5D.
W74-05268

A MATHEMATICAL MODEL FOR OPTIMIZING THE DESIGN OF REVERSE OSMOSIS SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W74-05276

6D. Water Demand

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04911

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
F. E. Ellis.
Paper presented at 1st World Congress on Water Resources, Sept 24-28, 1973, Chicago, Ill: International Water Resources Association, Milwaukee, Wisconsin, 1973. 16 p, 3 fig, 4 tab, 13 ref.

Descriptors: *Thermal powerplants, *Coal mines, *Water demand, Industrial water, Water supply, *Central U.S., Great Plains.
Identifiers: Western U.S.

Development of natural resources in the Western United States is dependent upon availability of water supplies. A large potential for the industrial development of eastern Montana, northeastern Wyoming, western North Dakota, and northwestern South Dakota exists in the vast deposits of lignite and sub-bituminous coal within the Upper Missouri River basin. Interest appears to be in using this coal in a dual-energy capacity. It can be converted to electrical energy or synthetic hydrocarbons, gasoline, and natural gas substitutes. Water is necessary to meet this technological development. (Knapp-USGS)
W74-04912

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
N. M. Jackson, Jr.
North Carolina Department of Natural and Economic Resources, Office of Water and Air Resources Publication, July 1973. 255 p, 4 fig, 6 ref.

Descriptors: *Water supply, *North Carolina, Water quality, Water resources, Municipal water, Water sources, Water works, Water distribution(Applied).

Information about the public water supplies in 18 counties in the southern Piedmont section of North Carolina is compiled; this information should be useful to planners and water managers concerned with water-supply availability, water-resources development, and water quality. A water-resources appraisal and a map of each county shows the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers. The appraisal includes the population served, the adjacent communities served, the number of metered customers, the source of water, estimated allowable draft, total and industrial water use, raw and finished water storage, raw and finished water-pumping capacity, future plans, a water-resources appraisal in the immediate vicinity of the supply, and the results of chemical analyses of raw and finished water. (See also W74-01040) (Knapp-USGS)
W74-04915

NORTH CAROLINA WATER PLAN-PROGRESS REPORT-CHAPTER 22, WATER BASED RECREATION.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Office of Water and Air Resources.
For primary bibliographic entry see Field 6B.
W74-04990

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-04996

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
For primary bibliographic entry see Field 6G.
W74-05083

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W74-05172

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-05185

REGIONAL WATER AND SEWER PLAN, THE MID-MISSOURI REGION.
Preston (D. R.), Holts Summit, Mo.
For primary bibliographic entry see Field 5D.
W74-05238

AREA-WIDE WATER AND SEWERAGE SYSTEM PLAN AND CAPITAL IMPROVEMENT PROGRAM.
Harte (John G.) Associates, Inc., Atlanta, Ga.; and Harris (Frederic R.), Inc., Jacksonville, Fla.
For primary bibliographic entry see Field 5D.
W74-05242

SAGINAW COUNTY WATER AND WASTEWATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
For primary bibliographic entry see Field 5D.
W74-05243

6E. Water Law and Institutions

SYSTEMATIC DESIGN OF LEGAL REGUL TIONS FOR OPTIMAL SURFACE-GROUN WATER USAGE--PHASE 1,
Colorado State Univ., Fort Collins. Dept. of Ci Engineering.
For primary bibliographic entry see Field 4B.
W74-04853

REASONABLE STATE REGULATION OF TI INTERSTATE TRANSFER OF PERCOLATIN WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

DETAILED PROJECT REPORT, DYERSBUR TENNESSEE, FINLEY STREET AREA.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W74-04989

STATUS OF STATE COASTAL ZO MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administ tion, Washington, D.C. Coastal Zone Managem Task Force.
For primary bibliographic entry see Field 2L.
W74-04995

A BIBLIOGRAPHY ON LEGAL AND REGUI TORY ASPECTS OF WATER POLLUTI CONTROL AND ABATEMENT, PART I: STRACTS.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 5G.
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGU TORY ASPECTS OF WATER POLLUTI CONTROL AND ABATEMENT, PART II: S JECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 5G.
W74-05005

A TREATISE ON CENTRALIZED MANA MENT OF WATER RESOURCES,
University of Southern Mississippi, Hattiesb Dept. of Economics.
D. C. Williams, Jr., and C. P. Cartee.
In: Watersheds in Transition; Proceedings of S posium held at Fort Collins, Colo, June 19 1972: Urbana, Illinois, American Water Resou Association Proceedings Series, No 14, p 7 1972. 1 fig, 1 tab, 5 ref. OWRR A-041-MISS (2

Descriptors: *Water management(Appl *Mississippi, *Planning, *State governm Federal government, *Governmental inter tions, Political aspects, Organizations, Adm tration.

Centralized water resource planning at the level in Mississippi has been an evolutio process and one that is still not complete. process has been complicated to some degre the number, function and organization of fed state and local agencies involved. The results been fragmentation, duplication and redund in planning, promotion, development and ma ment of water resources. Some of the caus factors leading to this situation and their ram tions are analyzed. A suggested structure of ganization is also provided for water reso agencies to the state as an alternative to elim or alleviate some of the problems. (Knapp-US
W74-05030

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
Y. M. Savvin, and Y. I. Serdyuk.
Typescript 8 p, 1972. Trans. from Gidrotekhnika i Melioratsiya, No 11, 1972.

Descriptors: *Water quality control, *Water utilization, *Irrigation programs, Water resources, Water management(Applied), Administration, United States.
Identifiers: *USSR, Technical exchange, Joint research.

During the Moscow meeting in May, 1972 leaders of the U.S.S.R. and the U.S.A. concluded Soviet-American agreements on joint research in the protection of the environment and on collaboration in science and technology. Specific areas of cooperation include water resources management; water quality control; irrigation systems planning and operation; automation and remote sensing as applied to water management; and the utilization of computers for the projection, construction, and management of reclamation systems. An exchange program of technical delegations between the U.S.S.R. and the U.S.A. is described. (Staplin-NWWA)
W74-05076

PUBLIC CONTROL AND REGULATION,
Melbourne Univ., Parkville (Australia).
L. D. Clark.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 12 p, 7 ref.

Descriptors: *Regulation, *Management, *Legal aspects, *Water law, *Water policy, Planning, Water resources development, Legislation, Governments, Groundwater.
Identifiers: *Licensing, Government control, Appeal boards, Protected zones.

Governmental control of groundwater is discussed, beginning with a definition of government as registrar and grantor of rights. The fiscal, social, and political factors influencing management are explored, concluding that only government can put together the necessary capital and human resources to plan, coordinate and execute major water development programs. The development of laws concerning surface water and groundwater is summarized, including factors dictating government control of these resources. An outline of modern groundwater legislation is presented, with special attention to the following: declaration of State title, licensing of bore construction, licensing of drillers, licensing of extraction and waste disposal, declaration of protected zones, appeal boards, and survey provisions. (Campbell-NWWA)
W74-05082

EC IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT IN ITS LICENSING AND REGULATION OF NUCLEAR FACILITIES,
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05186

URBAN WATER RESOURCES--POLITICS OF MANAGEMENT,
Macon and Thomas, Washington, D.C.
J. B. Francois.
Preprint No 1876, American Society of Civil Engineers, ASCE National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 18 p.

Descriptors: *Water resources development, Governments, *Political aspects, *Local governments, Political constraints, State governments, Federal government, Legislation, Institutions, Administration, Sanitary engineering, Water supply, Waste disposal, City planning, Regional development, History, Urbanization, Cities.

The need for water has progressed to the point where water resources management is no longer a simple issue to be determined by a select group of individuals. The needs for water have grown, and new forces have entered into the picture to formulate policies for wise use of the limited resources available. Water management in the past was left up to the individual, at first, when private wells supplied the water and privies were widespread. Later, as wells and springs became contaminated, the cities began to enter into the picture of water management. Even so, progress was slow, and sewage treatment facilities were often lacking. The superior political strength of the state governments relative to the cities resulted in some states establishing regional authorities to handle the problems. The federal Government, however, remained largely detached from the entire activity until recently. Now, federal standards are being imposed on local governments as a result of the realization that local governments needed assistance to establish adequate programs. Along with federal standards has come a new approach to the allocation of resources. Social, political, economic and other questions are being added to the scope of the planners' duties. (Poertner)
W74-05235

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 6F.
W74-05236

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5B.
W74-05285

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04993

FLOOD PLAIN INFORMATION; ROANOKE RIVER-CHOCOYOTTE CREEK; CITY OF ROANOKE RAPIDS AND TOWN OF WELDON, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04994

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
W. McGrath.
Southern Tier East Regional Planning Board, Binghampton, New York, February 1972. 20 p, 6 fig, 18 ref.

Descriptors: *Rivers, *River basin development, *Land management, *Flood plain zoning, *New York, River regulation, Water pollution control, Comprehensive planning, Water resources development, Floodways, Flood control, Parks, Land use, Land development, Urbanization, Conservation, Recreation facilities.
Identifiers: *Broome County(New York), *Tioga County(New York), Riverbank improvement.

Guided by the initial efforts of the Broome County Planning Department, the Southern Tier East Regional Planning Board has initiated a riverbanks improvement program of preservation and recreational development for Broome and Tioga Counties. The report is a brief description of factors which have influenced the program. Included within this framework is the concept of the program at its inception, current program status, and future program goals and objectives. There are approximately 120 miles of river segments traversing the Broome-Tioga area. Segment lengths range from a seven mile portion of the Delaware River in southeastern Broome County to a sixty mile section of the Susquehanna River which passes through the heart of the most densely populated portions of western Broome and eastern Tioga. In all, five rivers, the Chenango, Delaware, Otselic, Susquehanna, and the Tioughnioga, along with their constituent brooks and creeks, form the drainage basin for the two-county region. Although construction in floodable areas along the rivers has been discouraged by planning officials and municipalities through zoning ordinances, the desired effect has not been achieved. A list is included of the principles and policies established by the Southern Tier East Regional Planning Board. These were adopted in the formation of the Riverbanks Improvement Program for the two-county region. Initial efforts toward acquisition of specific sites along the riverbanks for recreational, educational and conservation uses are mentioned. Various financing programs of federal agencies are listed as possible sources of funds for land acquisition and development of open spaces, parks and conservation projects. (Poertner)
W74-05234

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
A. C. Lardieri.
*Floodproofing, *Building codes, *Legal aspects, Flood damage, Legislation, Design criteria, Regulations, Design standards, Flood protection, Flood plain zoning, Flood control, Floods, Flood stages, Flood plain insurance.

Few building codes require flood-proofing of new or existing structures as a condition for flood hazard area construction or occupancy. Thousands of structures in the United States are located in flood plains and many are partially or totally unprotected from the damages of flooding. Six methods of flood plain management involving non-structural alternatives are: (1) construction of flood protection works such as dams and levees, (2) flood insurance, (3) flood disaster relief, (4) flood plain regulation, (5) government purchase of flood prone land, and (6) flood-proofing. Flood-proofing is the least well known of these methods. It can be incorporated in building codes and complement other approaches to flood control. It is most useful at the fringes of flood prone areas, where the cost of flood-proofing would be minimal, encroachment on the floodway would be negligible, and the threat to life would be minimized. A reference flood level datum should be determined for equitable application of flood-proofing requirements. Regulations should allow for the use of alternative methods of achieving minimum established goals. (Poertner)
W74-05236

6G. Ecologic Impact Of Water Development

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
For primary bibliographic entry see Field 8A.
W74-04856

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
Copy available from GPO Sup Doc as EP1.23:600/5-73-009, $2.05; microfiche from NTIS as PB-229 574 $1.45. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-600/5-73-009, November 1973. 187 p, 6 fig, 4 tab, 217 ref. EPA Program. Element 1HA098.

Descriptors: *Aesthetics, *Environmental effects, Quality control, Decision making, Design standards, Design criteria, *Planning, Federal agencies, Federal reservations, *Regional analysis, *City planning, Scenery, *Research priorities, Management, *Social impact, *Attitudes.

Three primary aspects of the aesthetic concept are discussed: aesthetics and the human senses, aesthetics as thinking about the arts, and aesthetics as the science of beauty. Additional factors underlying the concept of aesthetics include: nature as an underlying force; cultural, social and economic phenomena as determiners of aesthetic expression; and aesthetics of American city life. Aesthetics is also discussed in the context of the National Environmental Policy Act. The following research projects are suggested: (1) Development of criteria for evaluating methodologies designed to assess aesthetic impacts--special emphasis on objectivity, secondary impacts, and aesthetics as an interrelated aspect of all environmental elements. (2) Increased emphasis on user preference studies for understanding individual attitudes and group values about aesthetic characteristics in the environment. (3) Development of aesthetic quality indicators for different levels of concern (national, state-regional, community-local) and devise monitoring techniques. (4) Development of methods for communicating aesthetic effects of changes resulting from planned activities--simulation labs for visual and auditory impacts. (5) Development of an information system for source material on aesthetic research. (EPA)
W74-04987

MAN'S ENVIRONMENT AND THE ATLANTIC ALLIANCE,
J. R. Huntley.
NATO Information Service: Brussels, Belgium. 1972. 2nd Ed, 62 p, Illus.
Identifiers: Books, Cities, *Environment, Health, Mans, *NATO, Safety, Society, *Water pollution, *Oil spills, *Coastal pollution.

The relationship between man's environment and the Atlantic Alliance is described. The origin of the idea for considering human environmental problems and the establishment of a Committee on the Challenges of Modern Society (CCMS) are discussed. The next section, shaping the human environment, discusses some indicators of problems, why it is an international crisis, and the ecological crisis in advanced nations. The areas in which NATO is working in the environment field: oil spills, coastal water pollution, inland water pollution, the clean engine, air pollution control, the experimental safety vehicle, aspects of road safety, disaster assistance, environment and regional development, scientific knowledge and decision-making, cities, the misuse of drugs, advanced health care, advanced waste water treatment, and environmental fellowships are discussed. A section is then included explaining the reasons why NATO is involved in this undertaking, followed by an explanation of the CCMS concepts and methods. A final section discusses the future of CCMS, including present results and prospects for the future. Three appendixes contain the following information: CCMS chronology, NATO/CCMS publications, and USA/Federal Republic of Germany bilateral agreement on the experimental safety vehicle.--Copyright 1973, Biological Abstracts, Inc.
W74-05027

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
M. D. Campbell, and W. A. Hunt.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 12 p.

Descriptors: Water resources development, Supply, *Water management(Applied), *Planning, *Water demand, *Water requirements, Industrial plants, Feasibility, *Management, Economics.
Identifiers: Private water supplies, Private motives, Government motives, Centralized service, Decentralized service, Contractual service, *Environmental protection.

The need for private water supplies is well established. The subsequent question of when and where private water systems are applicable is discussed. Economic and logistic feasibility are discussed, as well as public health interests, as a function of population density. The private and government motives for developmental and regulatory roles are explored, as well as the comparison between private systems and industrial requirements. Special attention is given to operation and maintenance systems, focusing on the following: implementation, centralized and decentralized service, contractual services, selection of an organizational structure, geography, politics, income level of users, education level and motivation of users, and management. (Staplin-NWWA)
W74-05083

RADIONUCLIDES IN ECOSYSTEMS, VOLUME I.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W74-05182

POLLUTION -- YESTERDAY, TODAY, AND TOMORROW,
For primary bibliographic entry see Field 5D.
W74-05272

MEASURING IMPACTS OF WATER RESOURCE DEVELOPMENTS ON THE HUMAN ENVIRONMENT,
Battelle-Memorial Inst., Columbus, Ohio.
J. K. Baker, and J. R. Finley.
Water Resources Bulletin, Vol 10, No 1, p 10-21, February 1974. 4 fig.

Descriptors: *Water resources development, *Social impact, *Economic impact, Social values, Employment opportunities, Environment, Psychological aspects.
Identifiers: *Human environment, *Environment impact.

An approach to measuring impacts of water resource developments on the human environment is described. This evaluation system employs a two-step assessment process. The first step is an assessment of the nature and magnitude of the impacts as reflected by parameter value estimates without and with the proposed project. The second step is the determination of overall impact by aggregating the magnitudes of specific impacts in proportion to their respective relative importance, and determining the difference between the aggregated without and with scores. (Knapp-USGS)
W74-05338

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

7. RESOURCES DATA

7A. Network Design

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W74-04975

7B. Data Acquition

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

PULSED D.C. MOTOR SPEED CONTROL FOR PORTABLE INSTRUMENTATION,
California Univ., Berkeley.
W. W. Schopp, and H. C. Richardson.
Instruments and Control Systems, Vol 46, No 12, p 45, December 1973. 3 fig.

Descriptors: *Instrumentation, *Monitoring, Pollutant identification.
Identifiers: *Pulsed DC speed control, Motors, Speed control, Controllers.

Many environmental testing instruments require that air be moved at a given rate through a filter for a specific time. This filter is then removed, and the pollutants that have been collected are measured. Most of these instruments use a blower powered by a small DC motor whose speed must be adjustable in order to calibrate the instrument. Many units are designed for portable field use, operate on batteries and use a power consuming series dropping resistor to alter the speed of blower motor. An effective speed control can be implemented by generating a square wave at a constant frequency and varying the duty cycle of the square wave. Additionally, removal of the series resistor increases the motor torque at the slower speed. The design uses a 24-volt DC motor. The pulsed DC speed control is designed around an inexpensive integrated circuit (IC) timing module with a base frequency of 250 kHz. The output pulse train is fed to the base of the Darlington connected transistors. Motor requirements up to 1 A may be handled. A resistor reduces the 24-V motor supply to 12 V for use with the IC, and may be removed if a 12-V supply is available. This control may be used for DC motors with current requirements up to 400 mA. (Mortland-Battelle)
W74-04895

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
P. G. White, K. R. Jenkin, R. C. Ramsey, and M. Sorkin.
Available from NTIS, Springfield, Va 2215 NASA CR-2311, Printed price $4.75 domestic $7.25 foreign; $1.45 microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2311, October 1973. 167 p, 101 fig, 5 tab, 5 ref. NASA contract NASI-10918.

Descriptors: *Remote sensing, *Spectrometers, *Oceanography, Instrumentation, Data processing, Data collections, *Chlorophyll, Pollutant identification.

Identifiers: Radiometry, *Spectroradiometers.

An imaging spectroradiometer (Multichannel Ocean Color Sensor) was designed, developed and flight tested. Computer routines were developed specifically for the program. These included routines to calibrate the data, convert units, plot spectra from specified points in the target area, apply algorithms to identify different types of matter in the water, and generate maps showing variations in the distribution of these algorithm values over the target areas. These maps can be prepared in false color, as density plots, or as contour plots. Data were obtained from both east and west coasts of the United States, the coast of Africa, the Canary Islands, the Gulf Stream, the Bahamas, and the Gulf of Mexico, as well as some freshwater lakes. Differences in chlorophyll concentrations less than 0.1 mg per cu m were readily detected and mapped from an altitude of 11,100 m. (Knapp-USGS)
W74-05026

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 4B.
W74-05077

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-05118

A THEORY OF MICROWAVE APPARENT TEMPERATURE OVER THE OCEAN,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 2B.
W74-05126

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2B.
W74-05169

RADIOLOGICAL SURVEY OF THE AREA SURROUNDING THE ELK RIVER REACTOR, ELK RIVER, MINNESOTA.
EG and G., Inc., Las Vegas, Nev. Aerial Surveillance Dept.
For primary bibliographic entry see Field 5B.
W74-05179

MINICOMPUTERS' ROLE IN MONITORING,
Digital Equipment Corp., Maynard, Mass.
For primary bibliographic entry see Field 5A.
W74-05297

POTENTIOMETER RECORDERS.
Measurements and Data, Vol 7, No 6, p 62-71, November/December 1973. 2 fig.

Descriptors: *Potentiometers, Resistivity, Specifications, Electronic equipment, Design standards.
Identifiers: *Recorders, Servomotors.

Null-balance recorders are servo-operated devices generally referred to as 'Potentiometers.' The advantages of the null-balance potentiometer are (1) high sensitivity, down to microvolt signals, and (2) independence of lead length. Nearly all process and test variables can be measured in terms of microvolt or millivolt electric signals, and often must be measured at large distance from the point of recording. The potentiometer recorder meets these needs. Further, the potentiometer can be used with minor modifications as a null-balancing bridge-input recorder, which is basically a resistance (or inductance or capacitance) measuring device. A departure from standard servo recorder design is the 'Speed Servo' with a response speed faster than potentiometer recorders which use servomotors, geartrains and cable or cord pen drive. In the 'Speed Servo' strings, pulleys, belts, gears and rotary servomotor are replaced by a servomotor whose armature operates back and forth like a shuttle. This armature features drive coil allowed to slide freely along the pole piece in a magnetic field (produced by the permanent magnet). Current in the drive c coil horizontally. Specifications (channels, FS response, comments, and prices) are given for potentiometers from 69 different suppliers. (Mortland-Battelle)
W74-05298

A SAMPLER FOR THE CHEMICAL ANALYSIS OF FRESHWATERS USING EVACUATED TUBES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
R. Jones, and C. J. S. Stuart.
Limnology and Oceanography, Vol 18, No 5, p 805-809, September 1973. 2 fig, 4 ref.

Descriptors: Freshwater, Chemical analysis, *Water sampling, Water analysis.
Identifiers: *Sampling equipment, *Water sampler.

A freshwater sampler is described having three evacuated glass tubes which fill simultaneously at the selected depth when each rubber sealing stopper is pierced by a hypodermic needle. Each tube acts as the sample collector and container. (Holoman-Battelle)
W74-05321

7C. Evaluation, Processing and Publication

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 4A.
W74-04852

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W74-04860

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
For primary bibliographic entry see Field 5A.
W74-04866

APPROXIMATING DISCRETE DISTRIBUTIONS, WITH APPLICATIONS,
California Univ., Riverside. Dept. of Statistics.
D. V. Gokhale.
Journal of the American Statistical Association, Vol 68, No 344, p 1009-1012, December 1973. 14 ref.

Descriptors: *Statistical methods, *Probability, Analog models, Algorithms.
Identifiers: *Discrimination information, Probability distribution, Contingency tables.

A generalized procedure is presented of finding the discrete distribution which minimizes, subject to a set of linear constraints on the probabilities, the 'discrimination information' with respect to a given probability distribution. A convergent iterative algorithm is modified to serve this purpose. Many applications are discussed including analyses of contingency tables and some discrete analogues of the one-sample and several-samples problem. A test for the validity of the imposed constraints is provided by a test-statistic distributed asymptotically like a chi sq
W74-04892

BAYESIAN ANALYSIS OF A BIVARIATE NORMAL DISTRIBUTION WITH INCOMPLETE OBSERVATIONS,
Temple Univ., Philadelphia, Pa. Dept. of Mathematics.
J. S. Mehta, and P. A. V. B. Swamy.
Journal of the American Statistical Association, Vol 68, No 344, p 922-927, December 1973. 1 fig, 2 tab, 11 ref.

Descriptors: *Statistical methods, Average, Distribution, Estimating, Equations, Statistical models.
Identifiers: *Bayesian analysis, *Bivariate normal population, Inferences, Data interpretation, Nuisance parameters, Incomplete observations, Difference of means.

A specific problem of making inferences about the difference of the means in a bivariate normal population is considered when the sample has some missing values corresponding to one or both variables. The purpose of the study was to evaluate the effects of extra observations from the populations of x sub 1 and x sub 2 on the overall inferences about the difference of the means. A Bayesian solution to the problem is offered. One advantage of the Bayesian approach is that the nuisance parameters can be eliminated by straightforward integration. The effects of extra observations from the populations of x sub 1 and x sub 2 on the overall inferences about the difference of the means can be evaluated by analyzing the marginal posterior distribution of the difference of the means which incorporates a proper allowance for the roles of the nuisance parameters in the model. (Mortland-Battelle)
W74-04893

MAXIMUM LIKELIHOOD ESTIMATION FOR MIXTURES OF TWO NORMAL DISTRIBUTIONS,
Colorado Univ., Denver. Medical Center.
N. P. Dick, and D. C. Bowden.
Biometrics, Vol 29, No 4, p 781-790, December 1973. 2 fig, 2 tab, 16 ref.

Descriptors: *Distribution patterns, *Probability, *Monte Carlo method, Average, Fisheries, Estimating, Size, Fish.
Identifiers: Variance, Hessian matrix, Normal distribution, Sample size, Maximum likelihood, Data interpretation, Difference of means, Mixtures.

Primary concern is focused on estimation of the parameters mu 1, rho 1 squared, mu 2, rho 2 squared, and p in the mixture of two normal distributions when independent sample information is available from one of the populations. The solution to the maximum likelihood (ML) equations was obtained using Newton's iterative method. Some interesting results for the moment estimates were obtained for the case when independent sample observations are available from one population. Extensive Monte Carlo simulation was employed to obtain the sample variances of the estimates as well as the estimated asymptotic variances. The variances of the estimates are influenced by the separation of the two means with respect to the variances, the mixture proportion (p), and, of course, the size of the sample. When the number of observations is small and the means

are not well separated, the sample variance of the estimates can be as much as three times greater than the estimated asymptotic variances. The problem motivating this research originated in fisheries where it was necessary to estimate the average lengths of the two separate plants of fish after one year, the population variances of the lengths, and the mixture proportion using the entire sample. (Mortland-Battelle)
W74-04898

THE ESTIMATION OF RELATIVE POTENCY FROM TWO PARABOLAS IN SYMMETRIC BIOASSAYS,
Edinburgh Univ. (Scotland). Dept. of Statistics.
For primary bibliographic entry see Field 5A.
W74-04899

IDENTIFICATION OF BACTERIA BY COMPUTER: GENERAL ASPECTS AND PERSPECTIVES,
Central Public Health Lab., London (England).
National Collection of Type Cultures.
For primary bibliographic entry see Field 5A.
W74-04909

IDENTIFICATION OF BACTERIA BY COMPUTER: IDENTIFICATION OF REFERENCE STRAINS,
Central Public Health Lab., London (England).
National Collection of Type Cultures.
For primary bibliographic entry see Field 5A.
W74-04910

BOMEX RAINY DAY ANALYSIS,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 2B.
W74-04921

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
1973. 45 p, 2 fig.

Descriptors: *Hydrologic data, *Data collections, Planning, Data processing, *Data storage and retrieval, Federal government, Water resources development, *Water quality standards, Baseline studies.
Identifiers: *Willamette River.

Members of the Advisory Committee were in general agreement that the Office of Water Data Coordination had done a good job during the past year of keeping them informed of developments in the resources and environmental information fields. Suggestions made during the general discussion which followed included: that the Geological Survey give serious consideration to establishing a closer working relationship between Federal water-data-collection agencies and those of the States; that consideration be given to holding joint meetings of the Federal Advisory Committee on Water Data and the Advisory Committee on Water Data for Public Use; and that State water-data programs be strengthened, and Federal and State efforts in the area of water-data collection and dissemination be blended into a single national effort. During the discussion the increasing need for environmental baseline data was stressed. A session was devoted entirely to a presentation and discussion of the pilot study, Intensive River-Quality Assessment of the Willamette River. (Knapp-USGS)
W74-04924

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W74-04984

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
For primary bibliographic entry see Field 7B.
W74-05026

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-05107

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 4B.
W74-05119

COLLECTION OF GROUNDWATER DATA,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 4B.
W74-05120

REGRESSION TECHNIQUES FOR ESTIMATION OF SULFATE IN STREAMS DRAINING AN AREA AFFECTED BY COAL MINING,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05125

ON THE AUTOMATIC COMPUTATION OF GEOELECTRIC SOUNDING CURVES,
Indian Inst. of Tech., Kharagpur.
R. K. Sarkar, and H. P. Patra.
Indian Hydrology, Vol 9, No 1, p 38-45, June 1973. 4 fig, 6 ref.

Descriptors: *Data processing, *Geophysics, *Electrical studies, Simulation analysis, Resistivity, Conductivity.

An algorithm is given for the construction of synthetic geoelectric sounding curves. The method presented is simple and fast, and can be operated with slower computers. Given the preliminary results of interpretation of resistivity sounding field data, the synthetic curves may be generated with the help of a digital computer with a prescribed accuracy limit. This serves as a check on the results of preliminary interpretation, and thus forms an integral part of geoelectric data interpretation. (Knapp-USGS)
W74-05129

LARGE RIVERS OF THE UNITED STATES.,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W74-05138

FOCAL ON THE PDP-9 COMPUTER,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
S. H. Whitlow.
Report Series No 24, 1973. 16 p, 11 ref, append.

Descriptors: *Digital computers, *Computer programs, *Programming languages, *Data processing, Hydrologic data, Canada.

In the Water Science Subdivision of the Canadian Inland Waters Directorate, the PDP-9 computer is used for a variety of scientific calculations. These include analysis of X-ray diffraction, viscosity, density, conductivity, and chromatographic experiments. Often results are needed quickly for calibration purposes or as parameters in subsequent experiments; alternately, mathematical analysis may be used to derive final results and to establish statistical criteria. Much of the data processing is done by means of programs written within the Subdivision and it is anticipated that some of these computer programs of general interest will be described in a future report. This report is designed to be an operating guide for running user programs on the Water Science Subdivision PDP-9 digital computer. It is to permit users with little or no computer background to run simple programs using the FOCAL (FOrmula CALculator or Formulating On-line Calculations in Algebraic Language) conversational language. Operating procedures have been gathered from various sources and are combined with techniques developed through usage to provide step-by-step direction. A new external function, FDRA, is described which adds a straight line display capability to FOCAL. Directions are given to utilize this feature in user programs and an example, 'Least-squares fit with scope display', is provided. (Knapp-USGS)
W74-05151

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
A. H. Truesdell, R. O. Fournier, and J. M. Thompson.
Available from NTIS, Springfield, Va 22151 PB 220 732; Price $3.00 printed copy; $1.45 microfiche. Computer Contribution USGS-GD-75-014, 1973. 9 p.

Descriptors: *Hot springs, *Mixing, *Water temperature, Geochemistry, Hydrogeology, Water chemistry, Silica.
Identifiers: Hydrogeochemistry.

Some warm (<80 dec C) springs originate from the subsurface mixture of hot and cold water. The computer program calculates the fraction and temperature of the hot water component from the temperature and silica contents of the warm spring and of normal cold springs of the area. (Knapp-USGS)
W74-05156

STORM OF MAY 5-6, 1973, IN THE DENVER METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W74-05171

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-05185

COTTON: A COMPUTER SIMULATION OF COTTON GROWTH,
Agricultural Research Service, Tucson, Ariz. Cotton Production Research Unit.
For primary bibliographic entry see Field 3F.
W74-05213

REGIONAL ENVIRONMENTAL POLLUTION STUDY: INVENTORY AND ANALYSIS.
Tulsa City-County Health Dept., Okla.
For primary bibliographic entry see Field 5B.
W74-05239

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05386

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.
W74-05388

8. ENGINEERING WORKS

8A. Structures

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
L. S. Gardner, and N. B. Hultquist.
Available from National Technical Information Service as PB-228 644 $16.50 in paper copy, $1.45 in microfiche. Iowa State Water Resources Research Institute, Iowa State University, Ames, Iowa. Report ISWRRI-58, December 1973. 258 p, 7 fig, 32 tab, 140 ref, append.

Descriptors: Dams, Environment, Floods, *Flood control, Land use, Reservoirs, Iowa, *Social impact, Ecology, *Social change, Recreation, Attitudes, *Environmental effects, *Post-impoundment.
Identifiers: Coralville reservoir(Iowa), *Iowa River(Iowa).

Human ecological impacts of the Coralville Dam and Reservoir, a flood control structure on the Iowa River, Iowa are described. Impacts include agricultural and urban land use changes, recreation participation growth, changes in stream hydrology, erosion, debris and problems associated with prolonged, controlled outflows from the dam and high water levels in the reservoir, and a number of indirect effects of these changes. Development of the project and the changing nature of concerns, conflicts and impacts over time are reviewed. Perceptions of floods and flood control are examined in a sample population along the Iowa River and the results compared with those on the Cedar River, an uncontrolled stream and the Des Moines, a recently controlled stream. Particular attention is directed to the flood of 1973. Prolonged and high outflows from the dam have produced downstream flooding on agricultural land. Resulting conflicts between farmers and the Corps of Engineers over the flood control structure and its operation have lessened its beneficial image at the local level. The research indicates careful attention should be directed to scale of impact, dynamics of impact, zone or location of impact, socio-economic distribution of impact and components of impact, in environmental and human ecological analyses.
W74-04856

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
For primary bibliographic entry see Field 5F.
W74-05006

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5F.
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05008

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05009

WATER MAIN LAYING,
Kuch and Watson, Inc., Lake Bluff, Ill.
For primary bibliographic entry see Field 5F.
W74-05010

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
For primary bibliographic entry see Field 5F.
W74-05011

OBSERVING FIRE PROTECTION REQUIREMENTS IN FUTURE WATER SYSTEM DESIGN,
Illinois Inspection Bureau, Chicago.
For primary bibliographic entry see Field 5F.
W74-05012

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
For primary bibliographic entry see Field 5F.
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
For primary bibliographic entry see Field 5F.
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
For primary bibliographic entry see Field 5F.
W74-05015

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 6F.
W74-05236

EQUIVALENT PIPE METHODS FOR OPTIMIZING WATER NETWORKS--FACTS AND FALLACIES,
Roorkee Univ. (India).
P. K. Swamee, and P. Khanna.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EEI, Proceedings paper No 10375, p 93-99, February 1974. 1 fig, 21 equ, 6 ref.

Descriptors: *Economics, *Environmental engineering, *Water distribution(Applied), *Water supply, *Networks, Optimization, *Pipes, Mathematical models, Systems analysis,
Identifiers: Equivalent length approach, Equivalent diameter approach.

A simple water supply loop has been optimized by lag-range-multiplier method. The equivalent length and equivalent diameter approaches for optimizing the same loop, and for water distribution network optimization in general, are critically examined, and the inherent fallacies are considered. The problem of minimizing water network cost reduces essentially to the optimization of a nonlinear objective function subject to nonlinear constraints involving nonanalytical functions. The problem in its original form is unsolvable by known mathematical techniques. Attempts to obtain optimal solution have been either through simplification of the physical problem via certain assumptions, or through the use of objective functions based on equivalent pipe concepts. This paper examines the latter approach to optimization of pipe networks. This approach towards optimization of water networks is based upon knowledge of the pressure surfaces a priori. (Bell-Cornell)
W74-05383

8B. Hydraulics

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
H. G. Wenzel, Jr.
Available from National Technical Information Service as PB-228 661 $7.00 in paper copy, $1.45 in microfiche. University of Illinois Water Resources Center Research Report No 74, 1973, 65 p, 25 fig, 4 tab, 20 ref, 2 append. OWRR B-063-ILL(2). 14-31-0001-3581.

Descriptors: *Pipe flow, Instrumentation, *Venturi meters, *Flow measurement, Discharge measurement, Urban drainage, Open channel flow, Design criteria, Performance, Optimization.
Identifiers: *Sewer flow, *Flow meter.

An experimental and analytical study was performed to develop the geometry for a Venturi type flow meter for use in sewer flow measurement. The meter consists of a constriction in the pipe which produces critical flow under open channel flow conditions and acts as a conventional Venturi meter under full flow conditions. The constriction is constructed using cylindrical segments whose diameters are larger than that of the pipe and which are attached to the sides of the pipe, leaving the invert and crown clear. Head loss characteristics and experimental rating curves for both open channel and full flow conditions are described. A procedure is presented, based on experimental data, to theoretically construct a rating curve if experimental calibration is impractical. Information is also presented to permit the selection of geometrical parameters for optimum performance for a specific installation.
W74-04857

EXPERIMENTAL DETERMINATION OF RUN-UP OF UNDULAR AND FULLY DEVELOPED BORES AND AN EXAMINATION OF TRANSITION MODES AND INTERNAL STRUCTURE,
Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
R. L. Miller.
Available from NTIS as AD-676 312 for $6.00 paper copy, $1.45 microfiche. Technical Report No. 8, prepared for the Office of Naval Research, June 1968. 47 p, 12 fig, 25 ref. Nonr-2121(26).

Descriptors: *Bores, *Waves(Water), *Shallow water, Slopes, Beaches, Aeration.
Identifiers: Long wave theory, Progressive waves, Breaking waves, *Run-up, *Wave run-up.

The run-up of undular surge and bore is determined experimentally, for four slopes each with 3 different bottom roughnesses. The run-up is strongly affected by both slope and bottom roughness. Experimental data on run-up, and changes in structure and celerity of the wave front during progression up slope, disagree in several fundamental aspects with presently published rele-

vant theory based on the non-linear long wave equations. Photographic evidence is presented of two related phenomena in the higher Froude number ranges of the fully developed bore. These are (a) the generation of large eddies which appear to form at the bore face and progress with decreasing diameter toward the rear of the bore, and (b) the associated inclusion of air into the internal portion of the bore (aeration). (Sinha-OEIS)
W74-04936

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. C. Shen.
Available from NTIS as AD-646 509 for $6.00 paper copy, $1.45 microfiche. Research Report No. 2-5, June 1965. 123 p, 49 fig, 1 tab, 33 ref, 2 append.

Descriptors: *Harbors, Model studies, *Tsunamis, *Bores, *Shallow water, Bays, Coasts, *Hawaii, *Hydraulic models.
Identifiers: Hilo Harbor(Hawaii), Bore generator.

Theoretical and experimental investigations were made of the generation of a bore by the three following types of bore generator: (a) piston type, (b) gate type, and (c) pneumatic type. The analyses were based on nonlinear shallow-water theory incorporated with bore conditions. The experiments were conducted in a test flume 1 ft wide and 40 ft long. Explicit solutions were obtained for the height, duration, and length of bores generated by each type of generator. The bore heights found experimentally agreed very well with the theoretical predictions. A numerical computation of the pneumatic chamber theory was also performed and showed remarkable agreement with test results of the pneumatic-type bore generator. A uniform slope of 3 percent was installed in the test flume to investigate the bore motion over a uniform slope. The bore transformation was found to agree with Whitham's approximate solution. The bore runup reached a height above still-water level 2.6 to 3.0 times greater than the initial height of the bore on the flat bottom. The breaking of the bore during its transformation was also studied. Due to its inexpensiveness and versatility, a pneumatic-type bore generator was recommended for use in the model of Hilo harbor, Hawaii for investigation of tsunami-wave attack at Hilo. (Sinha-OEIS)
W74-04946

EDGE BORES,
Tetra Tech, Inc., Pasadena, Calif.
D. Divoky, and J. Lane.
Final Report No. TT-P-282-73-1, prepared for Office of Naval Research, April 1973. 53 p, 30 fig, 1 tab, 7 ref. N00014-72-C-0366.

Descriptors: *Bays, *Bores, *Harbors, *Beaches, Landslides, *Coastal structures, *Waves(Water), Explosions, *Shore protection.
Identifiers: *Edge bores, Edge waves.

In an experimental test program, the wave height variation along a crest, from deepwater to shore, received primary attention. It was found that under certain conditions the wave height near shore could be as much as five times the offshore height. Such wave amplification is possible at the beach even in the case of zero angle of incidence. Empirical prediction rules were derived. In an edge bore the onshore segment travels at the offshore speed; large lateral flow continually replenishes losses in the edge bore breaking region; the crest is not refracted over the abrupt depth changes. While the offshore segment is limited in height by the offshore depth, the nearshore segment may in fact be of even greater height depending upon beach slope and angle of incidence. The practical importance of the edge bore phenomenon is that shoreline installations can be subjected to waves of very great height when the usual expectation might be only small waves. (Sinha-OEIS)
W74-04948

ESTUARY AND COASTLINE HYDRODYNAMICS.
For primary bibliographic entry see Field 2L.
W74-04950

HURRICANE STUDIES FOR NARRAGANSETT BAY,
Corps of Engineers, Waltham, Mass. New England Div.
J. B. McAleer.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 42, p 660-685, 1964. 12 fig, 16 ref.

Descriptors: *Hurricanes, *Shore protection, *Rhode Island, *Coastal engineering, *Surges, Flooding, Coasts, Mathematical models, *Bays, Hydraulic models.
Identifiers: Narragansett Bay(RI).

Hurricane flooding has emerged as one of the major coastal engineering problems of the Atlantic and Gulf Coast areas of the United States. Engineering and scientific investigations have been made to determine the fundamental mechanics of the hurricane surges that cause inundation of coastal areas and to develop practical and economical protection. Mathematical models and large hydraulic models were used for the Narragansett Bay studies of two major projects. The discussions presented are limited to the hydraulic studies of barriers at the mouth of the bay, known as the Lower Bay Barrier Plan, and the Fox Point Hurricane Barrier which is now under construction. (Sinha - OEIS)
W74-04970

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
For primary bibliographic entry see Field 2L.
W74-04971

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5F.
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05008

ENLARGEMENT OF THE CHESAPEAKE AND DELAWARE CANAL, HYDRAULIC AND MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
M. B. Boyd, W. H. Bobb, C. J. Huval, and T. C. Hill.
Available from NTIS as AD-768 779, $6.25 in paper copy. Technical Report H-73-16, October 1973. 436 p, 18 fig, 4 tab, 22 ref, 243 plates.

Descriptors: *Hydraulic models, *Mathematical models, Delaware River, Chesapeake Bay, *Canals, *Canal construction, Tidal effects, Density currents, Salinity, *Coastal engineering.

Enlargement of the sea-level C and D Canal connecting Chesapeake Bay and Delaware River from 27 by 250 ft to 35 by 450 ft, undertaken in 1954, was essentially complete by 1970 except for about a 2-mile reach at the Delaware River end. Concern about effects of the enlargement on the environmental and biological systems led to the decision to leave the unimproved reach intact, pending completion of extensive environmental studies. This report is concerned with the model studies. The existing Delaware River model was extended to include the 27- by 250-ft C and D Canal and Elk River and the propagation of tides and currents in the addition was verified. Tides, currents, salinities, and discharges were then measured for various head differentials across the canal. The canal was first enlarged to existing conditions (35 by 450 ft, except for the unimproved reach at the Delaware end) and subsequently to project conditions and comparative measurements were made. The critical phenomena affecting flow in the canal is head differential across the canal produced by Chesapeake Bay tides at the western end and Delaware River tides at the eastern end. The canal is a very dynamic system and can experience large differential changes daily. Net flow is toward the lower tide level and enlargement from 27 by 250 ft to August 1972 conditions caused net flow to be increased by a factor of about 4.8 and completion of enlargement will cause additional increases. Dye dispersion tests were made for 27 by 250 ft and completed canal conditions and a mean differential. An existing numerical model based on the one-dimensional unsteady flow equations was used for initial studies concerning net flow changes due on the enlargement. (Sinha - OEIS)
W74-05036

STUDY OF BEACH WIDENING BY THE PERCHED BEACH CONCEPT SANTA MONICA BAY, CALIFORNIA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
C. E. Chatham, Jr., D. D. Davidson, and R. W. Whalin.
Available from NTIS as AD-765 433, $4.50 in paper copy. Technical Report H-73-8, June 1973. 131 p, 18 tab, 20 ref, 1 append, 24 photos, 1 plates.

Descriptors: California, *Hydraulic models, *Coastal engineering, Beaches, Rip currents, Sediment transport.
Identifiers: Perched beaches, Freeway location, Rubble mound structures.

Hydraulic models were studied in determining the technical feasibility and optimum design factors of the perched beach concept for widening the existing beach to provide right-of-way for a freeway along a portion of the Santa Monica Bay coastline. The following parts of the study were completed: (a) An undistorted, three-dimensional, fixed-bed model (scale 1:100) was used to determine the effect of the perched beach on rip currents. If adverse interactions were found to be present, the model was to be used to determine means of minimizing them. (b) A distorted-scale (1:100 horizontal, 1:50 vertical), two-dimensional, movable-bed model was used to estimate the amount of sand which might be lost seaward over the toe of structure due to normal and storm wave action and to determine the optimum crown elevation of the submerged structure and the length of stone riprap apron required to reduce the seaward migration of sand to a minimum. (c) An undistorted two-dimensional model (scale 1:30) was used to determine the structural design of the proposed rubble-mound toe structure for various depths. (Sinha - OEIS)
W74-05039

BOREHOLE SAMPLING OF SATUARATED UNCEMENTED SANDS AND GRAVELS,
Commonwealth Scientific Industrial Research Organization, Syndal (Australia). Div. of Applied Geomechanics.
For primary bibliographic entry see Field 8G.
W74-05081

HE INTERPRETATION OF INTERFERENCE ESTS IN NATURALLY FRACTURED RESER-OIRS WITH UNIFORM FRACTURE DIS-RIBUTION,
tlantic Richfield Co., Dallas, Tex.
or primary bibliographic entry see Field 8G.
/74-05086

RESSURE INTERFERENCE EFFECTS VITHIN RESERVOIRS AND AQUIFERS,
tandard Oil Co. of California, San Francisco.
or primary bibliographic entry see Field 4B.
/74-05087

HE SKIN EFFECT IN PRODUCING WELLS,
. Hurst, J. D. Clark, and E. B. Braver.
ournal of Petroleum Technology, Vol 21, No 11, 1483-1489, November, 1969. 7 fig, 2 tab, 7 ref.

escriptors: *Flow rates, *Inflow, *Permeability, Wells, Boreholes, Fluid flow, Laplaces equation, il reservoirs, Pressure, Mathematical model.
lentifiers: *Skin effect, Positive skin, Negative kin, Pressure drop, Cumulative production.

he change in permeability in the zone around the ellbore is called the skin effect. If the permeabili- in the skin zone is less than that of the formation e skin is positive; if greater, the skin is negative. the two permeabilities are equal, there is no kin. Van Everdingen and Hurst have given athematical solutions to the case of a zone of educed permeability around the wellbore by treat- g the positive skin as a zone of reduced permea- lity of infinitesimal thickness. In calculating egative skin by this approach mathematical dif- culties arise. These can be overcome by assum- g an enlarged wellbore radius and using the same quations that apply for positive skin. The cumula- ve fluid influx into a well was calculated for posi- ve and negative skin values of 0, 2.5, 5, 10, 15, , and 50, and for dimensionless time ranging om 100 to 10,000,000. With increase in positive kin the fluid influx is decreased. The larger the solute value of a negative skin, the greater the pparent wellbore radius and the cumulative fluid flux into the well at any given time. (Gray-WWA)
/74-05088

NTERPRETATION OF BOUNDARY EFFECTS ROM PUMPING TEST DATA,
eological Survey, Trenton, N.J. Groundwater ranch.
. M. Lang.
ournal American Water Works Association, Vol 2, No 3, p 356-364, March, 1960. 6 fig, 2 tab, 6 ref.

escriptors: *Groundwater, *Wells, *Boundary rocesses, *Pumping test, Hydraulics, *Hydraulic odels, 8theis equation.
lentifiers: Theis nonequilibrium formula, Image ell model, Inverted image well model.

he hydraulic characteristics of an aquifer of in- nite areal extent and of uniform permeability that efine its abilities to store and transmit water are enerally determined from the analysis of pumping st data by means of various formulas. The nequilibrium formula developed by Theis is viewed. A modification is presented of the Theis rmula to extend its application to situations in hich the pumped formation is adjacent to nother formation of a vastly different transmissi- lity and the boundary between the formations pproximates a straight line. Image and inverted age well models are discussed. (Campbell-WWA)
/74-05089

ORROSION CONTROL SPEEDS UP,
lark, Dietz and Associates, Urbana, Ill. Environ- ental Engineering Section.
or primary bibliographic entry see Field 8G.
/74-05090

WELL COST ANALYSIS,
National Water Well Association, Houston, Tex. Research Facility.
M. D. Campbell.
Water Well Journal, Vol 27, No 6, p 41-44, June 1973.

Descriptors: Wells, *Water wells, Economics, *Cost analysis, Bids, Appraisals, *Construction costs.
Identifiers: *Well cost analysis, Guarantees.

Obtaining a safe and sanitary water supply of adequate quantity to satisfy the owner demands proper well cost analysis. A determination of water needs is a first step, followed by selecting a proper design to assure a sanitary supply. Factors to keep in mind when selecting a contractor are reviewed: reputation of contractor with previous customers, condition and type of equipment he uses, and contractors' design suggestions and guarantees offered. Comparing costs can be more effective by giving attention to the following questions: What capacity is desired; what well-life is desired; what well system efficiency is desired; what quality of well construction and completion will the customer accept. (Staplin-NWWA)
W74-05091

HOW AREAL HETEROGENEITIES AFFECT PULSE-TEST RESULTS,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-05092

LEAK DETECTION,
Compagnie Intercommunale Bruxelloise des Eaux (Belgium).
For primary bibliographic entry see Field 8G.
W74-05095

CHART TELLS ANNULAR CIRCULATION PRESSURES,
Continental Oil Co., Houston, Tex.
R. Goldsmith.
The Oil and Gas Journal, Vol 70, No 45, p 66-70, November 6, 1972. 5 fig, 1 tab, 6 ref.

Descriptors: *Laminar flow, *Flow resistance, Hydraulics, *Pressure, *Pumping, Viscous flow, Viscometers, Rheology, Muds, Drilling fluids, Gels.
Identifiers: *Annular circulative pressure, Plastic, Viscosity, Yield point, Initial gel strength, Rheometer.

A graphical method is a convenient means for the calculation of laminar pressure losses of time-independent non-Newtonian fluids in pipes and annuli. This procedure does not require an arbitrary model relating shear stress and shear rate. Measurements commonly made in the field are used. A smooth curve is drawn through the viscometer dial readings at 600 rpm, 300 rpm and the initial gel strength. The circulating pressure at various pumping rates can be read from the graph by referring to the applicable borehole-drill pipe combination. The effective increase in mud weight corresponding to the annular circulating pressure can be read from the chart. Examples are given of the use of the chart. (Gray-NWWA)
W74-05096

DESIGN AND USE OF RADIAL COLLECTOR WELLS,
California State Dept. of Public Health, Santa Rosa. Bureau of Sanitary Engineering.
S. V. Spiridonoff.
Journal American Water Works Association, Vol 56, No 6, p 689-698, June 1964. 4 fig, 1 tab, 13 ref.

Descriptors: *Groundwater, *Wells, *Design, Construction materials, Yield, Caissons.
Identifiers: *Radial collector wells.

Radial collector wells are horizontal perforated conduits that intercept and collect ground water derived principally from surface water infiltration. Such supplies are usually found in the sand and gravel deposits underlying and hydraulically connected with surface sources, such as rivers, lakes, or oceans. Discussed are design details, construction methods, expected yield, limitations, and typical installations of radial collector wells. This type of well enables a large area of an aquifer to be exploited, and the unrestricted access and independent control of each collector pipe permits easy regulation of flow into a caisson and inspection and backwash of the collector pipe. (Staplin-NWWA)
W74-05098

ACQUISITION AND ANALYSIS OF DATA FOR OPTIMIZED DRILLING,
Amoco Production Co., Tulsa, Okla.
J. L. Lummus.
Journal of Petroleum Technology, Vol 23, No 11, p 1285-1293, November 1971. 8 fig, 5 tab, 4 ref.

Descriptors: *Optimization, *Computer programs, *Drilling, *Drill monitors, *Well data, Data processing, Drilling equipment, Drilling fluids, Rotary drilling, Mud, Hydraulics, Cost analysis, Well casings, Blowouts.
Identifiers: 'Op Drilling' program, Drilling variables, Drill bits, Drilling rate.

The first step in preparing an optimized drilling program is to organize the data needed for computer input to calculate optimum values for the controllable drilling factors. The mud program is begun with the selection of the type of drilling fluid as determined by local conditions and experience in the area. The drilling equipment is analyzed to determine if additional mud-handling facilities are needed to maintain a low-solids mud. The hydraulics program is then generated, taking into account the mud, hole size and casing program, drill string and bottomhole assembly, limits of rig horsepower, pump pressure and capacity, and drillability of formations to be penetrated. Selection of the type of bit, rpm and weight on bit may be based on bit records and logs but will be modified as indicated by 'drill off' tests. Blowout control assistance consists of examples for instruction, well control tables and, by telephone, a well-kick model on a time-sharing computer system. As drilling progresses, the program is revised as required by analysis of daily performance and unexpected problems. The most effective method is to have a monitoring unit and computer at the rig. Lacking the computer at the drill site, the summarized information can be transmitted to a central location for analysis by specialists in drilling engineering. Computer-drawn plots permit examination of 23 variables. Usually, however, only six important variables are reviewed in a detailed analysis of the optimized program. (Gray-NWWA)
W74-05099

WELLBORE TRANSMISSIBILITY FROM AFTERFLOW-DOMINATED PRESSURE BUILDUP DATA,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-05101

CONTROLLED SOLUTION MINING IN MASSIVE SALT,
Texas Univ., Austin.
G. F. Sears, and F. W. Jessen.
Society of Petroleum Engineers Journal, Vol 6, No 2, p 115-125, June 1966. 11 fig, 2 tab, 8 ref.

Descriptors: *Storage capacity, *Leaching, *Underground storage, *Mining, Sodium chloride, *Computer programs, *Salts, Storage, Aqueous solutions, Solvent extraction, Pumping.

Identifiers: Massive salt, Salt domes, Solution-control blanket, Storage cavity, Fortran, Dissolution process.

The creation of underground storage cavities for natural gas and liquified gases by dissolving salt involves consideration of the shape of the cavity, the volume of the controlling blanket (oil, gas or air), the rate at which the salt is being removed, the area in the cavity undergoing solution, and the total time required at any point in the development of the planned configuration. The vertical height of the blanket/water interface can be detected by electrical or optical means. The other variables can be related to this independent variable. Equations are given to allow calculation of the total mass removed, the quantity of blanket material necessary to achieve the desired shape, and a computer program is proposed. Results are given for three cavity shapes, showing graphically the total volume removed and the rate of removal of salt as a function of time. A controlled solution mining program for a 100-ft vertical diameter solid conic in massive salt is shown in tabular form. (Gray-NWWA)
W74-05103

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
R. W. Hornbeck.
Available from GPO, Washington, D.C. 20402, Price $3.60, Stock No. 3300-0430. National Aeronautics and Space Administration Report SP-297, 1973. 339 p.

Descriptors: *Heat transfer, *Mixing, *Numerical analysis, *Flow, Open channel flow, Jets, Boundary layers, Convection, Pipe flow, Laminar flow, Equations, Mathematical studies, Mathematical models.
Identifiers: *Marching procedures(Mathematical).

Finite difference formulations and methods of solution are given for a wide variety of fluid flow problems with associated heat transfer. The use of the term marching technique applies to any numerical method of solving an initial value problem. The term is thus applied equally to implicit and explicit techniques for the solution of parabolic and hyperbolic differential equations. Typical problems of this type are those which include any arbitrary distribution of suction or injection at a body surface, body forces such as MHD or EHD forces, any class of variable properties including those in which tabulated property variations must be used, and any type of velocity or temperature boundary condition including convection, jets, variable boundaries, and open channel flow. In the appendixes a number of topics are discussed which are of interest with respect to finite difference equations. These include a very rapid method for solving certain sets of linear algebraic equations, numerical stability, the inherent error in flow rate for confined flow problems, and a method for obtaining high accuracy with a relatively small number of mesh points. (Knapp-USGS)
W74-05128

EXPERIMENTAL STUDY OF RIVER INCISION,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 2J.
W74-05134

AN INVESTIGATION OF CORE DRILLING IN PERENNIALLY FROZEN GRAVELS AND ROCK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-05170

8C. Hydraulic Machinery

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-04946

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
For primary bibliographic entry see Field 5F.
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
For primary bibliographic entry see Field 5F.
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
For primary bibliographic entry see Field 5F.
W74-05015

METHODS OF REDUCING POWER CONSUMPTION IN PUMPING WATER IN WATER SUPPLY SYSTEMS, INCLUDING THE USE OF BOOSTER STATIONS,
Moskovskii Inzhenerno-Stroitelnyi Institut (USSR).
N. Abramov.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p M3-M20 (1969). 7 fig.

Descriptors: *Water supply, *Pumping, *Pumped storage, *Distribution systems, *Automation, *Electric power, Optimization, Water utilization, Economics, Zoning.
Identifiers: Booster stations, Computer control, Telesignalling, *Moscow water supply system.

It is of great economic importance to find ways of reducing the power consumed in pumping water in urban water mains. There are various ways in which this reduction can be achieved, and they may also contribute significantly to reducing water pumping costs. They include the following: rational selection of number, capacity and location of pumping stations; rational selection of capacity and location of pressure regulating (storage) reservoirs; rational zoning of water supply systems, i.e. subdivision into zones for individual groups of consumers, depending on the geographical relief of the locality and the pressure heads required; control of the operation of individual pumping sets and of pumping stations as a whole when they operate together in a system, in order to achieve optimum conditions that minimize unproductive power consumption; and the use of pipes of relatively low head loss and their maintenance in service. Achieving optimum operating conditions in water supply systems in service is also aided by automatic control of system operation using telesignalling, automatic control and computer control. (Campbell-NWWA)
W74-05093

8G. Materials

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
For primary bibliographic entry see Field 5F.
W74-05006

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05009

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
For primary bibliographic entry see Field 5F.
W74-05011

BOREHOLE SAMPLING OF SATUARATED UNCEMENTED SANDS AND GRAVELS,
Commonwealth Scientific Industrial Research Organization, Syndal (Australia). Div. of Applied Geomechanics.
C. M. Barton.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resources', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 14 p, 2 fig, 11 ref.

Descriptors: *Sampling, *Cores, Drilling samples, *Hydrologic data, Soil analysis, Economic feasibility, Aquifer characteristics, Boreholes.
Identifiers: *Borehole sampling, Piston sampler, Open drive sampler, Jet sampler, Extension flap sampler, *In-situ freezing, *Pressure-dewatering, Chemical stabilization.

An outline review of borehole sampling of loose sandy materials for hydrological and water well design purposes is presented. Both standard exploration sampling procedures and more precise special techniques are discussed. A great variety of samplers are described, including open drive samplers; piston samplers (retractable, floating, and fixed); jet samplers; and extension flap samplers. In example circumstances, particularly for uncemented or poorly cemented gravels, it may be necessary to stabilize the strata prior to sampling. Consideration can be given in these cases to in-situ freezing, pressure-dewatering, or chemical stabilization of the strata to produce a truly representative and undisturbed sample. (Hunt-NWWA)
W74-05081

CATHODIC PROTECTION, CONTROL OF EXTERNAL CASING CORROSION,
Shell Oil Co., Midland, Tex.
M. T. Chapman.
Materials Protection and Performance, Vol 12, No 9, p 4-12, September, 1973. 8 fig, 10 ref.

Descriptors: *Wells, *Casing, Corrosion, *Corrosion control, *Cathodic protection, Anode, Cathode, *Texas.
Identifiers: *External corrosion, Rectifiers, Ground beds, Cathodic interference.

External corrosion of well casings, which can cause the loss of a well, has occurred in many areas of the United States. West Texas, a major problem area, has several thousand wells under cathodic protection, the only way to effectively combat external casing corrosion. Amperages needed for protection vary from 1 to as many as 50 amps, and the cost can vary from $3000 to $100,000 or more. Methods for determining the extent of corrosion are discussed, and detailed information on the design and installation of cathodic protection systems is presented. (Staplin-NWWA)
W74-05085

THE INTERPRETATION OF INTERFERENCE TESTS IN NATURALLY FRACTURED RESERVOIRS WITH UNIFORM FRACTURE DISTRIBUTION,
Atlantic Richfield Co., Dallas, Tex.
H. Kazemi, M. S. Seth, and G. W. Thomas.
Society of Petroleum Engineers Journal, Vol 9, No 4, p 463-472, December, 1969. 2 fig, 18 ref.

Descriptors: *Fractures(Geologic), *Oil reservoirs, *Drawdown, *Mathematical models, *Fluid flow, Porosity, Porous media, Pressure, Heterogeneity, Unsteady flow.
Identifiers: Buildup, *Interference tests, Matrix boundary effects, Warren-Root equations.

Both analytical and numerical solutions are offered to the problem of interpreting interference test results in naturally fractured reservoirs. Analysis is based on the concept of the fractured system as having both matrix porosity and fracture porosity. Radial flow to the wellbore is only through the fracture network and matrix flow is into the fractures. Certain other assumptions are made in arriving at the flow equations. The interference drawdown in an observation well while an adjacent well produced at constant rate was examined for five mathematical models representing a naturally fractured reservoir. The flow equations developed by Warren and Root can be used to interpret interference test data. For early time responses, an equivalent homogeneous model does not adequately depict interference drawdown behavior, but for late time responses results are satisfactory. The effects of well spacing and the magnitude of the interporosity flow parameter are briefly cited. (Gray-NWWA)
W74-05086

INTERPRETATION OF BOUNDARY EFFECTS FROM PUMPING TEST DATA,
Geological Survey, Trenton, N.J. Groundwater Branch.
For primary bibliographic entry see Field 8B.
W74-05089

CORROSION CONTROL SPEEDS UP,
Clark, Dietz and Associates, Urbana, Ill. Environmental Engineering Section.
P. Clinebell.
Water and Wastes Engineering, Vol 10, No 11, p 42-46, November, 1973.

Descriptors: Corrosion, *Corrosion control, Cathodic protection, *Sulfur bacteria, Electrochemistry, Hydraulic engineering, Construction materials, Chemical reactions, Coatings, *Pipelines, Water districts.
Identifiers: Regional water districts, Galvanic corrosion, Pressure fluctuation, Water hammer.

Recently Federal agencies have encouraged the regionalization of potable water supplies number and total length of long distance transmission pipelines for both water and wastewater facilities. This trend emphasizes the need to evaluate fully the material of construction for pipelines to assure protection against corrosion. Other factors related to durability such as soil conditions, terrain, and superimposed loads, should be considered in the design of these essential links to satisfactory service. Metallic pipe because of its chemical nature, is subject to interaction with materials it is transporting or the environment to which it is exposed. This interaction while relatively slow with some pipe materials is more rapid with others and results in deterioration or corrosion of the metallic material. Three commonly recognized types of corrosion are: (1) bacterial or biochemical oxidation; (2) galvanic corrosion or dissimilar metal activity in an electrolyte resulting in dissolution of metals from the exterior of the pipelines; (3) electrolysis or electrolytic corrosion by stray currents generated from external sources. The causes of the different types of corrosion and methods to protect against them are discussed in detail. Also discussed are additional areas that need consideration in the construction of long distribution pipelines. (Hunt-NWWA)
W74-05090

HOW AREAL HETEROGENEITIES AFFECT PULSE-TEST RESULTS,
Esso Production Research Co., Houston, Tex.
A. Vela, and R. M. McKinley.
Society of Petroleum Engineers Journal, Vol 10, No 2, p 181-191, June 1970. 10 fig, 2 tab, 6 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Heterogeneity, *Aquifer characteristics, Porous media, Diffusivity, Permeability, Porosity, Mathematical models, Flow.
Identifiers: *Pulse test, Directional correction, Influence area, *Well pair.

Reservoir transmissibility and storage values can be calculated by inducing pressure pulses in one well and measuring them in a second well. The equations used assume a homogeneous formation. Effects are examined of certain idealized types of areal heterogeneities on the calculated values. An influence area (rectangle) is described for the two wells. Only those heterogeneities within this area significantly affect pulse-test results. The manner in which a pulse test averages heterogeneities within the influence area is described for three limiting cases. These are the cases for which one of the three formation properties (hydraulic diffusivity, transmissibility, and storage) is constant throughout the influence area. A method is developed for the correction of pulse-test values of transmissibility and storage. This 'directional correction' method restores some, if not most, of the true degree of heterogeneity to these values (within the limitations of experimental error and model assumptions). (Gray-NWWA)
W74-05092

LEAK DETECTION,
Compagnie Intercommunale Bruxelloise des Eaux (Belgium).
I. M. Chalet.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p O3-O14, (1969). 12 ref.

Descriptors: *Leakage, *Water loss, *Watertight, Distribution systems, Pipes, Linings.
Identifiers: *Leak detection, Radioactive fluids, Gas dilution.

Leaks in a water distribution system can result in economic losses, decreased abundance of water resources, and the possibility of pollution if pressure falls at the location of a leak. Establishing the existence of leaks includes three possibilities: (1) continuous overall supervision of the network by the Water Authority; (2) incidents coming to light from time to time; and (3) systematic detection campaigns along the network by overall or itinerant methods. Special methods using radioactive fluids, gas dilution, and acoustic and electric-acoustic instruments are described. Other information helpful in discovering leak presence and location includes age of network; depth of pipelines; nature and lining of pipelines; and valves, seals, and cocks used. (Staplin-NWWA)
W74-05095

CHART TELLS ANNULAR CIRCULATION PRESSURES,
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8B.
W74-05096

UNUSUAL CASES OF COPPER CORROSION,
Calgon Corp., Pittsburgh, Pa. Corrosion Research Group.
G. B. Hatch.
Journal American Water Works Association, Vol 53, No 11, p 1417-1428, November 1961. 7 fig, 4 ref.

Descriptors: *Corrosion, *Pitting, *Copper, Aluminum, Iron, Zinc, Oxidation, Chemical reactions.
Identifiers: *Impingement, Cuprous oxide, Carbonized residues.

Copper, like other metals used for potable-water tubing, can be damaged from both general and localized corrosion. A thin, very fine grained film of cuprous oxide normally forms on copper surfaces exposed to potable waters; it is tightly adherent and quite highly protective. The effects of dissolved copper on zinc, iron, and aluminum corrosion are examined. Impingement attack is discussed in some detail, and pitting attack is reviewed for the following systems: cold water lines, hot water lines, domestic service lines, and sprinkler systems. Other causes of pitting, such as carbonized residues, are also discussed. (Campbell-NWWA)
W74-05097

DESIGN AND USE OF RADIAL COLLECTOR WELLS,
California State Dept. of Public Health, Santa Rosa. Bureau of Sanitary Engineering.
For primary bibliographic entry see Field 8B.
W74-05098

WELLBORE TRANSMISSIBILITY FROM AFTERFLOW-DOMINATED PRESSURE BUILDUP DATA,
Esso Production Research Co., Houston, Tex.
R. M. McKinley.
Journal of Petroleum Technology, Vol 23, No 7, p 863-872, July 1971. 13 fig, 6 ref.

Descriptors: *Permeability, Flow, *Graphical methods, *Transmissivity, Curves, Theis equation, Wells, *Pressure, Drawdown, Groundwater reservoirs.
Identifiers: Buildup, *Skin effect, *Afterflow, Fall-off, Shut-in.

Afterflow -- the continued influx of fluid from a formation into the wellbore after the well is shut in -- may furnish useful information. Pressure measurements should be more accurate during afterflow than later. The pressure change during afterflow should reflect a dynamic balance between (1) the capacity of the well to store fluid, and (2) the ease with which the formation supplies fluid to the wellbore (i.e., an indication of transmissibility). By the use of a set of type-curves prepared for pressure buildup in a homogeneous, radially finite reservoir, near-wellbore transmissibility is calculated directly from pressure buildup data without assuming formation properties. The generation and use of the type curves are described. Examples are given of the use of type curves with wellbores having a skin, a low permeability streak, and partial penetration. Five examples are given of the type-curve analysis of field data that were difficult to interpret conventionally. Although the examples relate to buildup tests, the method is applicable to drawdown, fall-off, and injectivity tests. (Gray-NWWA)
W74-05101

SELECTION, HANDLING, AND PROTECTION OF DOWNHOLE MATERIALS: A PRACTICAL APPROACH,
Atlantic Richfield Co., Dallas, Tex.
S. M. Bucaram, H. G. Byars, and M. Kaplan.
Materials Protection and Performance, Vol 12, No 9, p 20-26, September 1973. 5 fig, 4 ref.

Descriptors: Corrosion, *Corrosion control, Economics, *Training, *Engineering personnel, Materials, Pitting, Fatigue.
Identifiers: *Production personnel, *Downhole materials, Corrosion inhibition, Handling-caused failures.

A downhole failure control short course was designed as a means to supply production and engineering personnel with the know-how necessary to reduce subsurface corrosion and handling-caused failures. Specifically discussed were failure due to tension, wear, corrosion (both uniform and pitting), fatigue, methods of corrosion inhibition, and the economics of failure control. A study of equipment performance data fol-

lowing presentation of the short course indicated significant reductions in corrosion and handling-caused failures. (Campbell-NWWA)
W74-05102

ABATEMENT OF MINE DRAINAGE POLLUTION BY UNDERGROUND PRECIPITATION,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 5G.
W74-05106

COMBINED MILL EFFLUENT GOES TO AERATION POND IN PE (POLYETHYLENE) PIPELINE.
For primary bibliographic entry see Field 5D.
W74-05269

8H. Rapid Excavation

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05184

8I. Fisheries Engineering

COMBINED REARING OF THE PIKE-PERCH LUCIOPERCA LUCIOPERCA (L.) AND ROACH RUTILUS RUTILUS HECKELI (NORDM.) IN LIMAN FISH FARMS OF KUBAN, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
E. P. Tsunikova.
Vopr Ikhtiol. Vol 12, No 6, p 1073-1078, 1972.
Identifiers: *Fish farming, Liman fish farms, Lucioperca-lucioperca, Perch, *Pike-perch, Productivity, Rearing, Reproduction, *Roach, Rutilus-Rutilus-Heckeli, *USSR(Kuban), Fish foods.

Study of the habitats of young pike-perch Lucioperca lucioperca and roach Rutilus rutilus heckeli, degree of similarity of their food, and relative competition showed the expediency of their combined rearing in the estuarine fish farms of Kuban (USSR). With the combined rearing of the young of these fishes the food base is utilized more completely. The rearing of young pike-perch alone does not noticeably increase the effectiveness of its reproduction, but leads to a decrease of the fish productivity of bodies of water.–Copyright 1973, Biological Abstracts, Inc.
W74-04923

HOOD CANAL POND REVISION,
Washington State Dept. of Fisheries, Olympia.
R. Webb.
Available from NTIS, Springfield, Va 22151 COM-72-11198 Price $3.00 printed copy; $1.45 microfiche. Project Completion Report to NOAA, National Marine Fisheries Service, July 1972. 5 p, 3 photo. AFC-53.

Descriptors: *Fish hatcheries, *Washington, *Fish management, Fisheries, *Chinook salmon, Fish handling facilities.
Identifiers: *Fish holding ponds.

The concrete release pond at the Hoodsport Hatchery, Washington, was reconstructed into an adult holding pond so as to permit species segregation. When not in use for adult holding, it is to be used for juvenile rearing of chinook salmon. This is estimated to increase the station production by 15,000 pounds annually. (Knapp-USGS)
W74-05157

LOW PH LEVELS WIPE OUT SALMON AND TROUT POPULATIONS IN SOUTHERNMOST NORWAY,
For primary bibliographic entry see Field 5C.
W74-05356

DISTRIBUTION AND EPIZOOTIOLOGICAL IMPORTANCE OF DACTYLOGYRUS EXTENSUS (MONOGENOIDEA) IN SLOVAKIA (IN CZECH),
For primary bibliographic entry see Field 5C.
W74-05358

ON THE PROBLEM OF HOST SPECIFICITY, RESERVOIR PARASITISM AND SECONDARY INVASIONS OF CAMALLANUS LACUSTRIS (NEMATODA:CAMALLANIDAE), (IN CZECH),
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
For primary bibliographic entry see Field 5C.
W74-05359

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Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W74-04913

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NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

SANTA RITA EXPERIMENTAL RANGE: YOUR FACILITY FOR RESEARCH ON SEMIDESERT ECOSYSTEMS,
Forest Service (USDA), Tucson, Ariz., Rocky Mountain Forest and Range Experiment Station.
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Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W74-04913

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ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W74-04924

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A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART I: ABSTRACTS.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 05G.
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART II: SUBJECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 05G.
W74-05005

FUNDAMENTALS OF KARST SCIENCE. VOLUME 2 (OSNOVY KARSTOVEDENIYA. TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.
For primary bibliographic entry see Field 02F.
W74-05017

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 02B.
W74-05169

FOREST PRODUCTS POLLUTION CONTROL - ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
For primary bibliographic entry see Field 05B.
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KRAFT PULPING EFFLUENT TREATMENT AND REUSE - STATE OF THE ART,
Saint Regis Paper Co., Pensacola, Fla. Research and Development Center.
For primary bibliographic entry see Field 05D.
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FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 05D.
W74-05282

A REVIEW OF WATER ANALYSIS BY ATOMIC ABSORPTION,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W74-05292

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SELECTED WATER RESOURCES ABSTRACTS

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 11
JUNE 1, 1976

W76-05001 -- W76-05500

tary of the U.S. Department of the Interior has de-
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n of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

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FOREWORD

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Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

SALT AND NONELECTROLYTE INTERACTIONS IN WATER,
Pittsburgh Univ., Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W76-05245

2. WATER CYCLE

2A. General

A PROPOSED INDEX FOR COMPARING HYDROGRAPHS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, and W. M. Snyder.
Water Resources Research, Vol. 11, No. 6, p 1021-1024, December 1975. 6 fig, 8 ref.

Descriptors: *Hydrographs, *Hydrograph analysis, *Unit hydrograph, *Model studies, *Correlation analysis, Hydrology, Storm runoff, Time series analysis, Average.
Identifiers: *Pearson product-moment correlation coefficient, Standard deviations, Cross-product.

Existing goodness of fit indices are inadequate for comparing model-generated hydrographs with measured hydrographs. The Pearson product-moment correlation coefficient, which is the most frequently used index of regeneration, is inadequate because it is insensitive to differences in the size of the two hydrographs. A better coefficient of regeneration is obtained if Pearson's coefficient is adjusted by using a ratio of the standard deviations of the two hydrographs being compared. The resulting index is numerically the same as the regression of the hydrograph with the smaller variance on the hydrograph having the larger variance. Examples were used to illustrate the superiority of the modified correlation index. (Lardner-ISWS)
W76-05157

BAYESIAN GENERATION OF SYNTHETIC STREAMFLOWS.
Resource Analysis, Inc., Cambridge, Mass.
G. J. Vicens, I. Rodriguez-Iturbe, and J. C. Schaake, Jr.
Water Resources Research, Vol. 11, No. 6, p 827-838, December 1975. 10 fig, 6 tab, 13 ref, append. OWRT C-418(9021) (11). 14-310001-9021 NSF GK-41643X

Descriptors: *Statistical models, *Stochastic processes, *Synthetic hydrology, *Streamflow forecasting, *Time series analysis, Water resources development, Mathematical models, Model studies, Management, Projections, Decision making, New Hampshire.
Identifiers: *Bayesian analysis, *Blackwater River(NH), *Uncertainty, Synthetic streamflow generation.

Generation of synthetic streamflow traces has proven to be an extremely useful technique for the evaluation of water resources planning and management alternatives. But existing models do not account for the uncertainty in the streamflow parameters. Past research efforts have focused on obtaining 'best' estimates of these parameters which are then used as the 'true' values of the process. Bayesian methods were here used to overcome this shortcoming. By incorporating the parameter uncertainties into the generation scheme, alternatives may be evaluated under both the natural and the parameter uncertainties. This was accomplished by integrating over the probability distribution of the parameters to obtain the Bayesian, predictive, or unconditional probability distribution function (pdf) of the streamflows. Use of the Bayesian pdf for synthetic generation was shown to lead, on the average, to better designs under uncertainty conditions. (Morris-ISWS)
W76-05271

A BAYESIAN APPROACH TO ANALYZING UNCERTAINTY AMONG FLOOD FREQUENCY MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2E.
W76-05272

HYDROLOGIC SEMANTICS,
Geological Survey, Reston, Va.
N. C. Matalas, and T. Maddock, III.
Water Resources Research, Vol 12, No 1, p 123, February 1976.

Descriptors: *Hydraulic models, *Mathematical models, *Technical writing, *Reviews, Evaluation, Technology, Translations, Calibrations, *Model studies.
Identifiers: *Semantics.

There is an aura of mystique that surrounds mathematical modeling of water resources systems. Perhaps some of the mystique is due to the semantics of modeling rather than to the accomplishments of modeling. The literature describes three basic steps in mathematical modeling: (1) identification, (2) calibration, and (3) verification. Identification implies that one has available a set of models that covers all aspects of the physical system of interest and has sufficient information to select the model that applies. Calibration implies that for the parameters of the identified model, one has control over the degree of accuracy in a particular estimation. Verification implies that the identified calibrated model, tested under controlled conditions, mimics the physical system of interest and therefore the identified calibrated verified model is to be accepted. The words identification, calibration, and verification are misleading because of their connotation of greater understanding of and control over the physical processes than actually exist. Perhaps the words selection, parameter estimation, and acceptance are more in line with the true capabilities of modeling. The modeler in fact selects from a finite set of available models, estimates the model's parameters under less than controlled conditions, and then on the basis of some criterion of 'goodness of fit' accepts or rejects the model. The words selection, parameter estimation, and acceptance remind us that a model is an abstraction of the physical process and not the physical process per se. (Woodard-USGS)
W76-05414

2B. Precipitation

FAR-INFRARED AND SUBMILLIMETER WAVE ATTENUATION BY CLOUDS AND RAIN,
RAND Corp., Santa Monica, Calif.
D. Deirmendjian.
Journal of Applied Meteorology Vol. 14, No, 8, p 1584-1593, December 1975. 3 fig, 4 tab, 37 ref.

Descriptors: *Attenuation, *Infrared radiation, *Microwaves, *Weather, Clouds, Rain, Fog, Water vapor, Water, Electromagnetic waves, Radio waves, Radio communication systems, Optical properties, Refractivity, Absorption, Raindrops, Drops(Fluids), Meteorology, Electrical engineering.
Identifiers: Extinction coefficient, Raindrop size distributions, Far-infrared radiation, Submillimeter waves.

Newly determined optical constants for water at far-infrared and submillimeter wavelengths, as revealed by a recent survey, were used to estimate water cloud and rain attenuation over the wavelength range between 12 micrometer and 2 cm. For this purpose new analytic drop-size distribution models simulating fog, nimbostratus cloud and rain, corresponding to rainfall rates of 10 and 50 mm/h, were set up. The corresponding volume extinction and absorption coefficients as computed according to polydisperse Mie scattering theory at specific wavelengths were listed in tables and presented graphically in plots for purposes of interpolation. It was found that cloud extinction may exceed 50 nepers per kilometer in the region of wavelengths less than about 100 micrometers, whereas for wavelengths longer than 200 micrometers, under near-saturated conditions, water vapor absorption should be the dominant attenuator. The greatest attenuation by heavy rain may be expected around a wavelength of 5 mm with a value of about 5 nepers per kilometer. The results also suggested that in the presence of nonprecipitating water clouds or fog there may be a relative transmission 'window' centered around a wavelength of 1.3 mm. (Sims -ISWS)
W76-05164

AN APPROXIMATION FOR THE SHAPES OF LARGE RAINDROPS,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
A. W. Green.
Journal of Applied Meteorology, Vol. 14, No. 8, p 1578-1583, December 1975. 2 fig, 1 tab, 19 ref, 2 append.

Descriptors: *Raindrops, *Drops(Fluids), *Model studies, Mathematical models, Cloud physics, Shape, Evaporation, Reynolds number, Pressure, Dynamics, Meteorology.
Identifiers: *Shapes of raindrops, Terminal velocities, Aerodynamic pressure.

A simple model was proposed for approximating the shapes of raindrops in terminal fall equilibrium. The equilibrium figures of raindrops are complex, but they can be represented approximately as oblate spheroids, which have axis ratios determined by the balance of surface and gravity forces at the equator. The axis ratios and drop diameters predicted by the model correlated well with experimental and other theoretical results. Using empirical formulas for evaporation from ellipsoids and the results of the model, estimates of ventilation coefficients were made. It was found that drop deformation may cause a small diminution of ventilation coefficient compared with evaporation from an equivalent sphere. (Sims - ISWS)
W76-05165

ANTARCTIC SEA-ICE VARIATIONS FROM SATELLITE SENSING IN RELATION TO CLIMATE,
Department of Science, Melbourne (Australia). Antarctic Div.
For primary bibliographic entry see Field 7B.
W76-05398

2C. Snow, Ice, and Frost

SYMPOSIUM ON REMOTE SENSING IN GLACIOLOGY.
International Glaciological Society, Cambridge (England).
Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, 1975. 482 p.

Descriptors: *Conferences, *Remote sensing, *Glaciology, *Ice, *Snow, *Antarctic, *Arctic, *Arctic Ocean, Snow cover, Glaciers, Cold regions, Analytical techniques, Satellites(Artificial),

Surveys, Radar, Measurement, Water temperature, Temperature, Physical properties, Optical properties, Electrical properties, Sonar, Lake ice, Sea ice.
Identifiers: ERTS, Satellite imagery, Radio-echo sounding.

Remote sensing is a new and important tool for glaciologists. The symposium objective was to provide a comprehensive guide to remote sensing for those using it to study ice. Subject areas included reviews of the present state of the art in various branches of remote sensing, and the reporting of recent and topical work of studies relating to snow and ice. (See W76-05373 thru W76-05400) (Humphreys - ISWS)
W76-05372

THE ELECTRICAL PROPERTIES OF SNOW AND ICE,
Birmingham Univ. (England). Dept. of Physics.
J. W. Glen, and J. G. Paren.
IN: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 15-38, 1975. 10 fig, 3 tab, 66 ref.

Descriptors: *Remote sensing, *Electrical properties, *Snow, *Ice, Glaciers, Conductivity, Electrochemistry, Laboratory tests, On-site investigations, Temperature, Cold regions, Glaciology, Radio waves.
Identifiers: Dielectric dispersion.

This paper reviewed the electrical properties of snow and ice that are of importance in remote sensing using electrical devices. After a review of the observed laboratory behavior of ice samples and the microscopic theory which has been advanced to explain this, data on temperate and polar glacier ice were compared with the laboratory data. Temperate glacier ice is generally rather similar to laboratory ice, but certain relaxation processes found in the laboratory are absent from the glacier ice. Polar ice, on the other hand, is considerably different in its dielectric behavior from 'pure' laboratory ice, or temperate glacier ice; in many ways it more resembles doped laboratory ice, despite its variable, sometimes low, impurity content. It also resembles in behavior ice produced by freezing supercooled water. The electrical behavior of snow, and the attempts to account for this in terms of the behavior of the ice and air components, and also of the water component in wet snow, were next discussed. Finally, the implications of this work for radio-echo sounding of ice, radar reflectivity from wet and dry hydrometeors, devices for determining the water content of snow, and resistivity surveys of glaciers were discussed. (See also W76-05372) (Sims - ISWS)
W76-05373

THE DIELECTRIC PROPERTIES OF ANTARCTIC ICE,
Birmingham Univ. (England). Dept. of Physics.
W. J. Fitzerald, and J. G. Paren.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 39-48, 1975. 5 fig, 26 ref.

Descriptors: *Ice, *Antarctic, *Electrical properties, Glaciers, Laboratory tests, Conductivity, Temperature, Cold regions, Glaciology, Radio waves.
Identifiers: Dielectric dispersion, *Dielectric properties.

Two 0.5 m cores from 'Byrd' station, Antarctica, were studied in the laboratory, one from a shallow depth (155 m) and the other from the zone where recrystallization has given a vertical c-axis fabric and the air in situ is thought to be in clathrate form (1,424 m). The dielectric response was studied in the frequency range 60 Hz to 10 kHz, and in the temperature range -6 C to -60 C. The behavior observed was markedly different from that of 'pure' polycrystalline ice such as may be made by slowly freezing distilled de-ionized water. The Antarctic ice was shown to have properties similar to those of the ice from 'Camp Century' and 'Site 2' in Greenland. In an attempt to discover what factors determine the difference in electrical behavior between polar ice and pure ice, some samples were melted and subsequently refrozen slowly. Their dielectric response was similar to that of pure polycrystalline ice. These results were discussed in connection with the impurity content and growth conditions of the ices. (See also W76-05372) (Sims - ISWS)
W76-05374

RADIO-ECHO SOUNDING: GLACIOLOGICAL INTERPRETATIONS AND APPLICATIONS,
Scott Polar Research Inst., Cambridge (England).
G. de Q. Robin.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 49-64, 1975. 2 fig, 49 ref.

Descriptors: *Ice, *Remote sensing, *Glaciers, Radar, Sounding, Ice cover, Bedrock, Aircraft, Navigation, Electrical properties, On-site data collections, Glaciology.
Identifiers: *Radio-echo soundings

After a brief review of factors relevant to the propagation of radio waves in ice, problems of profiling the upper and bedrock surfaces of ice sheets were considered. These include deconvolution of echo traces and accurate navigation. Results already available not only provide knowledge of sub-ice geomorphology, but also confirm our general ideas on interaction of temperature and flow in large ice sheets. Difficulties encountered in the study of temperate glaciers appear to be due to irregular dielectric properties of the ice mass, which in turn suggest an irregular distribution of water. In the future, application of radio-echo methods should lead to more detailed knowledge of accumulation and ablation over ice masses, improve our understanding of temperatures at great depths in polar ice sheets, and give data on ice movement from central areas of ice sheets. (See also W76-05372) (Sims -ISWS)
W76-05375

THEORY OF RADIO FROM GLACIER BEDS,
Bristol Univ. (England). H. H. Wills Physics Lab.
M. V. Berry.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 65-74, 1975. 4 fig, 11 ref.

Descriptors: *Glaciers, *Ice, *Remote sensing, Aircraft, Radar, Sounding, Data processing, Analytical techniques, Bedrock, Glaciology.
Identifiers: *Radio-echo soundings

The theory of interpreting the echoes received back at the source from a glacier bed illuminated with a wide-angle beam of quasimonochromatic radio waves was reviewed. It is convenient wherever possible to separate bed relief into 'geography' and 'roughness'. 'Geography' is the surface that results from horizontally smoothing the bed over distances comparable with the mean height h of the source above the bed. The geography can be deduced from the time delays of specular reflections, provided these can be identified. 'Roughness' is the statistics of the departures of the actual bed from the geography on scales down to about one-tenth of the predominant wavelength in the travelling pulse. The average height S and horizontal dimension L (where these quantities can be defined) of the irregularities can be deduced from measurements of the average value of the echo envelope rho as a function of time delay. It is also possible to distinguish qualitatively different beds with the same S and L. If the source-receiver unit moves keeping h constant, then rho fluctuates about its mean value. This 'spatial fading' can be used to detect horizontal ice displacements of less than one hundredth of a wavelength. To detect vertical ice motion it is necessary to observe the phase of the echo. (See also W76-05372) (Sims-ISWS)
W76-05376

INVESTIGATIONS OF SUB-ICE BEDROCK CHARACTERISTICS BY RADIO-ECHO SOUNDING,
Scott Polar Research Inst., Cambridge (England).
G. K. A. Oswald.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 75-87, 1975. 10 fig, 1 tab, 6 ref.

Descriptors: *Ice, *Glaciers, *Remote sensing, *Antarctic, Radar, Sounding, Aircraft, Bedrock, Lakes, Analytical techniques, Glaciology.
Identifiers: *Radio-echo soundings.

Qualitative inspection of the results of the 1971-72 Scott Polar Research Institute-National Science Foundation Antarctic radio-echo sounding program showed that it is possible to infer some characteristics of the lower face of the ice from the form of received echoes. The existence of lakes of liquid water beneath the east Antarctic ice was confirmed by inspection of the top and bottom surface gradients of the ice, and it was suggested that basal melting occurs over a wide area in this region. Quantitative studies in Devon Island indicated that small-scale irregularities in the bedrock are characterized by slopes of about 1 in 40, with some higher gradients present, possibly indicating the presence of morainal boulders. It was deduced that a geological boundary was crossed between 25 and 40 km west of the base camp, the rock to the west of the boundary having lower permittivity and higher surface slopes than that to the east. The question of the usefulness of the spatial fading of the echo in deducing surface characteristics was briefly discussed. It was concluded that measurements of the fading are indeed useful, especially in the case of echoes with short 'tails'. (See also W76-05372) (Sims-ISWS)
W76-05377

GLACIER SLIDING MEASURED BY A RADIO-ECHO TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
British Antarctic Survey, London (England).
C. S. M. Doake.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciologyl, Vol. 15, No. 73, p 89-93, 1975. 1 fig, 2 tab, 5 ref.

Descriptors: *Glaciers, *Remote sensing, *Velocity, *Antarctic, Radar, Aircraft, Sounding, Surveys, Ice, Bedrock, Analytical techniques, Glaciology.
Identifiers: *Radio-echo soundings, Glacier sliding.

An attempt to measure the surface velocity of a glacier by observing radio-echo fading patterns appears to have yielded instead a measure of the bottom sliding velocity. The basal sliding of a glacier more than 1,000 m thick was measured by observations from the surface. The sliding velocity was inferred from the difference between apparent surface velocities measured by two different techniques. The true surface velocity was determined by classical optical surveying using fixed marks on surrounding mountains. A radio-echo technique gave the surface velocity relative to

reflecting layer for radio waves near the ice-bedrock boundary. The difference between these velocities gave the motion of the reflecting layer relative to the glacier bedrock. While the radio-echo method of measuring ice surface velocities may give false values in areas where basal sliding occurs, where true velocity can be checked by other means the technique appears valuable for learning about conditions near the base of the ice. (See also W76-05372) (Sims-ISWS)
W76-05378

LAYER ECHOES IN POLAR ICE SHEETS,
Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
P. Gudmandsen.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 95-101, 1975. 3 fig, 9 ref.

Descriptors: *Ice, *Glaciers, *Remote sensing, Radar,Sounding, Aircraft, Bedrock, Analytical techniques, Glaciology.
Identifiers: *Radio-echo soundings, *Greenland, Ice layers.

A multitude of extensive layers have been observed by radio-echo soundings in Greenland. By comparison with the stable isotope profile from Camp Century, it was found that layering in the top of the ice has been formed in the period since the last glaciation. Radio-echo layers observed at greater depths in central Greenland may have been created in the period of the interstadials and further down possibly in the period prior to the last glaciation. Further investigations are needed to prove this. (See also W76-05372) (Sims-ISWS)
W76-05379

RADIO-ECHO SOUNDING OF THE LAMBERT GLACIER BASIN,
Department of Sciences, Melbourne (Australia). Antarctic Div.
I. I. Morgan, and W. F. Budd.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 103-111, 1975. 7 fig, 1 tab, 9 ref.

Descriptors: *Glaciers, *Ice, *Remote sensing, Antarctic, Aircraft, Ice cover, Radar, Sounding, Bedrock, Geology, Mountains, Glaciology.
Identifiers: *Radio-echo soundings, *Lambert glacier basin(Antartica), *Ice thickness.

Several seasons of aerial ice-thickness soundings over the region of the Prince Charles Mountains, the Lambert Glacier system, the Amery Ice Shelf, and their drainage basin in east Antarctica have now been completed. The measurements provided detailed maps of surface topography and ice thickness over an area of about 200,000 sq km. The equipment used consisted of a 100 MHz echo sounder carried in a Pilatus Porter aircraft. ERTS imagery provided a valuable background for portraying the echo-sounding results. These results showed that an extensive, deep subglacial valley system forms the basis of the large drainage basin with concave ice surface topography which channels the ice flow into the Amery Ice Shelf. Deep glacial streams penetrate a long way into the ice-sheet basin. The rock relief is considerable, varying from 3,000 m above (present) sea-level to 2,000 m below sea-level. A very deep subglacial trench exists in the region of the confluence of the Fisher, Mellor, and Lambert Glaciers where the ice thickness reaches 2,500 m. The low surface slope and high ice velocity are suggestive of high melt production in this region. The strong echo, together with the high bedrock back-slope, suggests that the deep trench may contain a basal melt basin. (See also W76-05372) (Sim-ISWS)
W76-05380

ADVANCES IN GEOPHYSICAL EXPLORATION OF ICE SHEETS AND GLACIERS,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics; Wisconsin Univ., Madison. Geophysical and Polar Research Center.
C. R. Bentley.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 113-135, 1975. 18 fig, 51 ref.

Descriptors: *Glaciers, *Ice, *Exploration, *Geophysics, Seismic studies, *Remote sensing, Borehole geophysics, Investigations, Sounding, Radar, Ice cover, Anisotropy, Physical properties, Glaciology.
Identifiers: *Radio-echo soundings.

The techniques of geophysical exploration can be used in a number of ways to investigate the internal characteristics of ice bodies. Anisotropy resulting from nonrandom ordering of crystal axes produces effects on seismic wave propagation speeds measurable by both refraction and reflection techniques. The effects on shear waves are particularly strong, so the recent development of an effective shear-wave generator should prove very useful. Marked effects on radio-wave polarizations have also been noted, but are not readily interpretable because the anisotropic dielectric characteristics of single-crystal ice in the radio-echo frequency range are not yet known. Elastic internal friction can be determined by careful measurements of seismic-wave amplitudes. Dielectric properties of the ice can be found from VLF propagation experiments and electrical logging in drill holes as well as from the radio-echo sounding techniques. An activation energy can be estimated from d.c. resistivity measurements where the temperature profile is known. Recent developments have led to much improved methods of determining density-depth variations and long-term mean annual snow accumulation rates from seismic refraction shooting. (See also W76-05372) (Sims - ISWS)
W76-05381

COMPARISON OF ELECTROMAGNETIC AND SEISMIC-GRAVITY ICE THICKNESS MEASUREMENTS IN EAST ANTARCTICA,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05382

VELOCITY OF RADIO WAVES IN ICE BY MEANS OF A BORE-HOLE INTERFEROMETRIC TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05383

ULTRASONIC PROPERTIES OF PLASTICALLY DEFORMED ICE,
Institut National des Sciences Appliquees Lyon (France). Laboratoire de Physique des Materiaux.
J. Tatibouet, R. Vassoille, and J. Perez.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 161-169, 1975. 8 fig, 19 ref.

Descriptors: *Ice, *Sound waves, *Ultrasonics, *Attenuation, Properties, Mechanical properties, Laboratory tests, Crystallography, Temperature, Deformation, Plastic deformation, Strain.

Many investigators have used propagation of ultrasonic waves in ice for glaciological studies. This propagation is characterized by the velocity of sound and by the attenuation of stress waves. In crystalline materials, these two characteristics depend on structural state. In particular, plastic deformation gives velocity and attenuation variations. The sound velocity and attenuation of ultrasonic waves were measured in strained specimens of ice (single crystals and polycrystals). These measurements, done between 100 and 273 K at a frequency of 5 MHz, showed that plastic deformation leads to an increase of attenuation and an increase of velocity. Annealing treatments at 271 K caused recovery of propagation characteristics. The variation in attenuation can be interpreted by the theory of dislocations. This interpretation was supported by data on the influence of frequency on this increase of attenuation induced by plastic deformation, but the theory of dislocations implies a decrease of modulus, i.e., of velocity, hence it was postulated that an added phenomenon screens the effect of dislocations. That phenomenon could be connected with ageing effects observed on different physical properties of ice and may be due to modification of protonic arrangement or creation of interstitials during plastic deformation. (See also W76-05372) (Sims - ISWS)
W76-05384

APPLICATION OF RADAR TECHNIQUES TO ICE AND SNOW STUDIES,
Communications Research Centre, Ottawa (Ontario).
For primary bibliographic entry see Field 7B.
W76-05385

INTERPRETATION OF SLAR IMAGERY OF SEA ICE IN NARES STRAIT AND THE ARCTIC OCEAN,
Defence Research Establishment, Ottawa (Ontario).
For primary bibliographic entry see Field 7B.
W76-05386

SEA-ICE RECONNAISSANCE BY RADAR,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 7B.
W76-05387

COMPARISON OF SEA-ICE TYPE IDENTIFICATION BETWEEN AIRBORNE DUAL-FREQUENCY PASSIVE MICROWAVE RADIOMETRY AND STANDARD LASER/INFRARED TECHNIQUE,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 7B.
W76-05388

TEMPERATURE MEASUREMENT OF ICE AND WATER SURFACES IN THE NORTH WATER AREA USING AN AIRBORNE RADIATION THERMOMETER,
Eidgenossische Technische Hochshule, Zurich (Switzerland). Geographisches Institut.
For primary bibliographic entry see Field 7B.
W76-05389

THE ANALYSIS OF THE NEAR-SURFACE ENERGY TRANSFER ENVIRONMENT FROM THERMAL INFRARED IMAGERY,
Michigan Univ., Ann Arbor. Dept. of Geography.
For primary bibliographic entry see Field 7B.
W76-05390

SIGNIFICANCE OF SURFACE TEMPERATURE IN THE THERMAL INFRARED SENSING OF SEA AND LAKE ICE,
Army Engineer Topographic Labs., Fort Belvoir, Va. Center for Remote Sensing.
For primary bibliographic entry see Field 7B.
W76-05391

SEASONAL EFFECTS ON GROUND-WAVE PROPAGATION IN COLD REGIONS,
Research Inst. of National Defence, Stockholm (Sweden).
For primary bibliographic entry see Field 7B.
W76-05392

CHARACTERIZATION OF COLD-REGIONS TERRAIN USING AIRBORNE LASER PROFILOMETRY,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 7B.
W76-05393

A SUBMARINE SONAR STUDY OF ARCTIC PACK ICE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05394

OPTICAL PROPERTIES OF SALT ICE,
Cold Regions Research and Engineering Lab., Hanover, N. H.
J. W. Lane.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 363-372, 1975. 6 fig, 12 ref.

Descriptors: *Ice, *Optical properties, *Laboratory tests, Salinity, Opacity, Light, Bubbles, Salts, Instrumentation.
Identifiers: *Light transmission, Extinction coefficient, *Salt ice.

The dependence of the extinction coefficient on salinity was investigated for both NaCl-ice and salt-ice made from natural sea-water. Specimens were prepared under a variety of conditions and examined over the wavelength range 4,000 to 8,000 angstroms. The effects of scattering from air bubbles trapped in the ice were examined for ice made from distilled water. It was found that the method of preparing samples markedly affected their structure, but that, when prepared in the same manner, salt-ice made from natural sea-water and NaCl-ice did not show significantly different transmission properties. It was found that, for a wavelength of 6,328 angstroms, the extinction coefficient could be related to the salinity of the ice within an uncertainty of 26%. Within an uncertainty of 10%, there was no variation in transmission for ice at the same temperature and salinity over the wavelength range 4,000 to 8,000 angstroms. All measurements were made at a temperature of -20 C. (See also W76-05372) (Sims-ISWS)
W76-05395

SATELLITES--NEW GLOBAL OBSERVING TECHNIQUES FOR ICE AND SNOW,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W76-05396

ERTS DATA IN GLACIOLOGY--AN EFFORT TO MONITOR GLACIER MASS BALANCE FROM SATELLITE IMAGERY,
Norges Vassdrags- og Elektrisitetsvesen, Oslo.
For primary bibliographic entry see Field 7B.
W76-05397

ANTARCTIC SEA-ICE VARIATIONS FROM SATELLITE SENSING IN RELATION TO CLIMATE,
Department of Science, Melbourne (Australia). Antarctic Div.
For primary bibliographic entry see Field 7B.
W76-05398

THE USE OF ERTS PHOTOGRAPHS TO MEASURE THE MOVEMENT AND DEFORMATION OF SEA ICE,
Bristol Univ. (England). H. H. Wills Physics Lab.
For primary bibliographic entry see Field 7B.
W76-05399

GENERAL DISCUSSION, THE STATE OF THE ART--AND WHERE DO WE GO FROM HERE.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No.73, p 437-453, 1975. 2 fig, 7 ref.

Descriptors: *Remote sensing, *Glaciers, *Ice, *Snow, Satellites(Artificial), Radar, Aircraft, Aerial photography, Microwaves, Permafrost, Sea ice, Data storage and retrieval, Data processing, Equipment, *Reviews.

The final session of the symposium was devoted to a 'brain-storming' general discussion of remote sensing of ice and snow. The session chairman divided the discussion into four sub-topics: (1) snow, (2) glaciers and ice sheets, (3) floating ice, and (4) ground ice. Various participants were asked to begin the discussion of each of these subtopics with a list of what they as users would like remote sensing to provide. After these discussions, there were a few comments relating to problems of data storage and retrieval, and new developments in remote sensing equipment. (See also W76-05372) (Sims - ISWS)
W76-05400

CHEMICAL SORTING EFFECT AT THE BASE OF AN ALPINE GLACIER,
Brussels Univ. (Belgium). Laboratoire de Geomorphologie.
R. A. Souchez, and R. D. Lorrain.
Journal of Glaciology, Vol. 14, No. 71, p 261-265, 1975. 1 fig, 1 tab, 10 ref.

Descriptors: *Glaciers, *Chemistry, *Mud-water interfaces, Mud, Chemical properties, *Ion exchange, Cations, Cation exchange, Ions, Chemicals, Electrolytes, Groundwater, Connate water, Cold regions, Alpine, Glaciology.
Identifiers: *Glacier d'Argentiere(Western Alps).

A frozen mud layer plastered at the base of the Glacier d'Argentiere in the Western Alps acts as an ion-exchange membrane for the interstitial water passing through it, causing electrolyte filtration and relative retardation of cations. This interstitial water, which is forced under a pressure gradient of about 3 bar/cm, refreezes in the form of ice accretions. A comparison of the chemical composition of these ice accretions and water held at their surface (corresponding to the situation after the forcing) and the water in contact with the mud layer (corresponding to the situation before the forcing) showed a desalinating effect, a monovalent-diavalent cation species separation, and a sorting effect between the alkalies as well as between the alkaline-earths. This phenomenon has to be taken into account in the study of the chemical composition of stratified ice containing interbedded mud layers which occurs in the basal part of several glaciers. (Sims-ISWS)
W76-05403

REMOTE SENSING,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7B.
W76-05431

2D. Evaporation and Transpiration

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Nebraska Univ. Lincoln. Dept. of Agricultural Engineering.
N. J. Rosenberg, K. L. Blad, S. B. Verma, and M. W. Baradas.
Available from the National Technical Information Service, Springfield, Va 22161,as PB-250 454 $6.75, in paper copy, $2.25 in microfiche. Completion Report, Agricultural Meteorology Report 75-3, December 1975, 160 p. OWRT B-028-NEB(1) 14-310001-4146.

Descriptors: *Boundary layers, *Evapotranspiration, *Remote sensing, Heat resistance, Infrared radiation, Thermal radiation, Crops, Nebraska, Model studies, Kansas, Measurement, Instrumentation, *Great Plains, Soybeans, Sorghum.
Identifiers: *Resistance models, *Thermal imagery, Millet.

The objectives of this project conducted in cooperation with the Kansas State University Evapotranspiration Laboratory were: (1) to test the utility of a resistance model for estimating evapotranspiration rates over large areas; (2) to determine the feasibility of obtaining ground and crop temperature data by remote sensing with infrared thermometry and the accuracy achievable by these means; and (3) to quantify the boundary layer resistance to diffusion as a function of crop height, crop roughness and wind speed. Resistance models were tested in an extensive set of experiments conducted at Manhattan, Kansas using soybeans and sorghum; Mead, Nebraska using sorghum; and Scottsbluff, Nebraska using millet. The three stations were equipped with precision weighing lysimeters which provide a standard measure of actual ET against which the models can be compared. A specially equipped aircraft of the Remote Sensing Institute of South Dakota State University at Brookings overflew the experimental fields on a number of occasions to provide thermal imagery of the crops.
W76-05179

2E. Streamflow and Runoff

A PROPOSED INDEX FOR COMPARING HYDROGRAPHS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-05157

BAYESIAN GENERATION OF SYNTHETIC STREAMFLOWS.
Resource Analysis, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 2A
W76-05271

A BAYESIAN APPROACH TO ANALYZING UNCERTAINTY AMONG FLOOD FREQUENCY MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
E. F. Wood, and I. Rodriguez-Iturbe.
Water Resources Research, Vol 11, No 6, p 839-843 December 1975. 4 fig, 11 ref. OWRT C-4118 (9021) (12). OWRT 14-31-0001-9021

Descriptors: *Statistical models, *Flood frequency, *Mathematical studies, *Model studies, Streamflow forecasting, Monte Carlo method, Probability, *Risks.
Identifiers: *Bayesian analysis, *Model uncertainty, *Flood frequency models, Probability models, Normal process model, Log normal process model, Exceedance model.

The statistical uncertainty resulting from the lack of knowledge of which model represents a given stochastic process was analyzed. This analysis of model uncertainty led to a composite Bayesian distribution. The composite Bayesian distribution is a linear model of the individual Bayesian probability distributions of the individual models weighted by the posterior probability that a particular model is the true model. The composite Bayesian probability model accounts for all sources of statistical uncertainty, both parameter uncertainty and model uncertainty. This model is the one one that should be used in applied problems of decision analysis, for it best represents the knowledge, or lack of it, to the decision maker about future events of the process. (Morris-ISWS)
W76-05272

RESISTANCE TO FLOW IN A COMBINED CHANNEL,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W76-05273

MEAN ANNUAL RUNOFF IN CENTRAL ASIA AND WESTERN KAZAKH DESERTS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
G. T. Leshchinskii.
Probl Osvoeniya Pustyn'. 3: 43-49, 1974.

Descriptors: *Runoff, *Annual, *Deserts, Asia, Precipitation(Atmospheric), Clays, *Watersheds(Basins).
Identifiers: *USSR(Central Asia), *USSR(Western Kayakostan).

The mean annual runoff in clayish catchment areas is 5000-35000 m3/km2 in the deserts of Middle Asia and Western Kazakhstan USSR. It increases with excessive precipitation; in years with negligible precipitation, it decreases, or is completely absent.--Copyright 1975, Biological Abstracts, Inc.
W76-05304

FLOOD PROFILES AND INUNDATED AREAS ALONG THE DESCHUTES RIVER, WASHINGTON,
Geological Survey, Tacoma, Wash.
J. R. Williams.
Open-file report 75-395, 1976. 35 p, 17 fig, 3 tab.

Descriptors: *Flood profiles, *Flood data, *Streamflow, *Flood plains, *Washington, Flood peak, Flood recurrence interval, Flow measurement, Gaging stations, Runoff, Flood frequency, Hydrographs, Hydrologic data.
Identifiers: *Deschutes River(Wash), Inundated areas.

Flood profiles on the Deschutes River, Washington, from 2.2 miles to 40.7 miles upstream from the mouth were developed as part of a cooperative program with the State of Washington, Department of Ecology, to identify areas subject to flooding. Flood-frequency analyses, based on 25 years of record at one gaging station and 19 years of record at another, indicate that the 100-year flood would have a discharge of about 9,070 cfs at river mile 25.9 and a discharge of about 10,000 cfs at river mile 3.4. The highest flood discharge during the period of record (1949-present) occurred January 15, in 1974, and was 7,780 cfs at river mile 5.9. The estimated recurrence interval of this flood is 45 years. Estimated water-surface elevations during a 100-year flood indicate that virtually all of the flood plain would be inundated. (Woodard-USGS)
W76-05415

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS--OKLAHOMA,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4A.
W76-05416

A METHOD FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 4A.
W76-05422

ANNUAL MAXIMUM STAGES AND DISCHARGES OF NORTH CAROLINA STREAMS,
Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 7C.
W76-05423

GEOHYDROLOGIC RECONNAISSANCE AND MEASUREMENT OF PERENNIAL STREAMS CROSSING OUTCROPS OF THE MADISON LIMESTONE, NORTHEASTERN WYOMING, 1974,
Geological Survey, Cheyenne, Wyo.
F. C. Boner, G. C. Lines, M. E. Lowry, and J. E. Powell.
Open-file report 75-614, January 1976. 63 p 2 fig, 1 plate, 4 tab, 4 ref.

Descriptors: *Hydrogeology, *Streamflow, *Perennial streams, *Wyoming, Gaging stations, Stream gages, Flow measurement, Data collections, Geologic formations, Properties, Limestones.
Identifiers: *Madison Limestone outcrops(Wyo).

During the summer of 1974, a geohydrologic field reconnaissance was made of 55 perennial streams crossing outcrops of the Madison Limestone of Mississippian age in the Power River structural basin in northeastern Wyoming. Areas investigated were the Laramie Mountains, the Bighorn Mountains, the Hartville Uplift, and the Black Hills Uplift. Following the reconnaissance, 32 gaging stations were established to monitor streamflow. Miscellaneous discharge measurements were obtained on ungaged streams three times during the summer and fall of 1974. The report summarizes the geohydrology for each area, lists the discharge measurements made through early December 1974, and lists the locations of gaging station and miscellaneous discharge measurement sites. (Woodard-USGS)
W76-05425

HYDROLOGIC UNIT MAP--1974, CARIBBEAN REGION.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-05430

2F. Groundwater

GEOHYDROLOGY OF KARST TERRAIN, LOST RIVER WATERSHED, SOUTHERN INDIANA,
Indiana Univ., Bloomington, Water Resources Research Center.
R. V. Ruhe.
Available form the National Technical Information Service, Springfield, Va. 22161, as PB-250 117, $5.00 in paper copy, $2.25 in microfiche. Report of Investigation No. 7, December 1975. 91 p, 28 fig, 7 tab, 45 ref. OWRT C-3122(No. 3689)(1).

Descriptors: *Geomorphology, *Groundwater, *Karst, Soils, Surface waters, Backwater, Corrosion, Discharge(Water), Drainage, Dyes, *Evapotranspiration, Flood frequency, Ions, Sinks, *Soil moisture, Soil water, Subsurface flow, Tracers, Transmissivity, Watershed(Basins), *Indiana, *Hydrogeology, Water chemistry.
Identifiers: *Lost River Watershed(Ind), Southern Indiana.

Geomorphology, soils, bedrock, and surface- and ground-water hydrology were modeled and systems analyzed. Subwatersheds were defined by drainage nets and dye-traced subsurface conduits. Hydrologic response to storm events varies from wetter to drier and transitional seasons; flood frequencies, flows of surface-subsurface water systems, and watershed and subwatershed budgets were analyzed. Evapotranspiration was determined by neutron-probe measurements of soil moisture in model unit cells. In the surface-subsurface-resurgence flow systems, an imbalance occurs frequently. Backwater conditions develop in the conduits causing poorer drainage of the systems. Water levels in sinkholes fluctuate rapidly and greatly in response to rainfall. The transmissivity to bedrock was modeled. Ion concentrations in surface and conduit waters generally vary inversely with discharge. The hydrochemical systems change from a Ca-Mg-HC03-S04 to a Ca-HC03 mix from low to high discharges. Soil water is a low Ca-low Mg-HC03 mix. Bedrock is the major contributor of ions to ground-water. Corrosion in the watershed can be quantified. Problems in planning for watershed protection and flood prevention are identified.
W76-05004

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 1,
Princeton Univ., N. J. Dept. of Geological and Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05010

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 2,
Princeton Univ., N. J. Dept of Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05011

PUBLIC GROUNDWATER SUPPLIES IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05130

PUBLIC GROUNDWATER SUPPLIES IN CALHOUN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05131

PUBLIC GROUNDWATER SUPPLIES IN MASSAC COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05132

EXPANSION OF SALT-WATER ZONE DUE TO WELL DISCHARGE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2I..
W76-05133

WATER FLOW THROUGH A MULTILAYER STRATIFIED HILLSIDE,
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim.
Water Resources Research, Vol. 11, No. 6, p 949-957, December 1975. 13 fig, 3 tab, 11 ref. OWRT A-026-FL.A(6).

Descriptors: *Groundwater movement, *Stratification, *Mathematical models, Equations, Aquifers, Beds, Hydraulic conductivity, Saturated flow, Groundwater potential, Boundary layers, Depth, Ponds, Flow nets, Seepage, Flow rates, Potentiometric level, Subsurface runoff, Slopes.
Identifiers: *Multilayered aquifers, Hillsides, Flow region, Streamlines, Stream functions.

The objective of this study was to present a mathematical analysis for steady state saturated flow through multilayer stratified hillsides of semi-infinite depth. Two soil surface shapes were considered: a constant soil surface slope and a surface of arbitrary shape. Potential and stream functions were obtained for one-, two-, and three-layered hillsides. The method of solution was based on the Gram-Schmidt orthonormalization method. For two-layered hillsides the hydraulic conductivities considered were K sub 1 : K sub 2 = 1:10 and 10:1. For three-layered hillsides the hydraulic conductivities were K sub 1 : K sub 2 : K sub 3 = 1:10:1 and 10:1:10. Flow nets, seepage velocities, and flow rates were presented. These results were useful particularly with regard to subsurface flow, runoff, erosion, and solute movement through sloping soils. (Visocky-ISWS)
W76-05134

INFLUENCE OF SURFACE ACTIVE AGENTS ON MOVEMENT OF WATER IN SOIL,
Regional Inst. of Tech., Jamshedpur (India). Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W76-05154

TRANSFORMATIONS OF FLUXES AND FORCES DESCRIBING THE SIMULTANEOUS TRANSPORT OF WATER AND HEAT IN UNSATURATED POROUS MEDIA,
Agricultural Research Service, Riverside, Calif.
P. A. C. Raats.
Water Resources Research, Vol. 11, No. 6, p 938-942, December 1975. 18 ref.

Descriptors: *Subsurface flow, *Porous media, *Heat transfer, *Analytical techniques, *Groundwater, Unsaturated flow, Mathematical studies, Equations, Hydrothermal studies, Temperature, Thermal water, Heat, Diffusivity.
Identifiers: *Multiphase flow, Onsager relations, Phase change, Heat and water transport, Meixner's theorem.

Balances of mass for the water in n distinct phases and a balance of heat for the medium as a whole were formulated. Following Philip and de Vries, it was assumed that the flux of water in each phase is proportional to the gradient of the pressure in that phase and that the diffusive component of the flux of heat is proportional to the gradient of the temperature. Clapeyron equations were used to express the gradient of the pressure in any phase in terms of the gradient of the pressure in a reference state and of the temperature. The reference state may be the water in one of the phases or the water in some measuring device such as a tensiometer or a psychrometer. Expressions for the total flux of water and for the diffusive flux of heat plus the convective flux of heat associated with the conversion from any phase to the reference state were shown to satisfy the Onsager reciprocal relations. A theorem due to Meixner was used to delineate the class of fluxes and forces that preserves these relations. In particular, it was shown that if the gradients of water content and temperature are used as the driving forces, the Onsager relations are no longer satisfied. (Prickett-ISWS)
W76-05159

GUIDELINES FOR THE SELECTION OF TURBINE PUMP MATERIALS FOR USE IN GROUNDWATERS,
Queensland Univ., Brisbane (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8G.
W76-05406

STRATIGRAPHIC AND HYDROLOGIC RELATIONSHIP OF THE PINEY POINT AQUIFER AND THE ALLOWAY CLAY MEMBER OF THE KIRKWOOD FORMATION IN NEW JERSEY,
Geological Survey, Mineola, N.Y.
B. Nemickas, and L. D. Carswell.
Journal of Research of the U S Geological Survey, Vol 4, No 1, p 1-7, January-February 1976. 8 fig, 2 tab, 13 ref.

Descriptors: *Aquifer characteristics, *Geologic formations, *New Jersey, *Groundwater resources, *Water quality, Hydrogeology, Water wells, Water yield, Water supply, Chemical analysis, Petrology, *Stratigraphy.
Identifiers: *Piney Point aquifer(NJ).

Coarse quartzose (clastic) sediments of middle and late Eocene age in the subsurface of southern New Jersey are identified in this report as the Piney Point aquifer. The sediments are as thick as 220 feet and form a freshwater aquifer which is laterally continuous with the Piney Point aquifer of the Delmarva Peninsula. The Alloway Clay Member, the basal unit of the Kirkwood Formation, rests on the Piney Point aquifer. Where present, it acts as a confining unit for the Piney Point aquifer in southern New Jersey. Chemical analyses of water samples from the Piney Point aquifer in Cumberland County indicate a potential chloride problem in the aquifer near Delaware Bay. A water sample taken in 1973 at the Gandys Beach well contained 516 milligrams per litre of chloride, and a water sample taken in 1973 at the Money Island Marina well contained 73 milligrams per litre of chloride. Scant water-level data indicate the possibility of declining water levels in Cumberland County near Delaware Bay due to pumping from the Piney Point aquifer in Delaware. (Woodard-USGS)
W76-05412

GROUND WATER DEVELOPMENT AND POTENTIAL IN WADIS KHULAYS AND FATIMAH, SAUDI ARABIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-05419

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-05420

GROUND-WATER DATA NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 7C.
W76-05424

2G. Water In Soils

GEOHYDROLOGY OF KARST TERRAIN, LOST RIVER WATERSHED, SOUTHERN INDIANA,
Indiana Univ., Bloomington, Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W76-05004

PHOSPHORUS MOVEMENT IN SOILS: THEORETICAL ASPECTS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-05048

UNSATURATED FLOW DURING SOIL TREATMENT OF SEPTIC TANK EFFLUENT,
Soil Survey Inst., Wageningen. (Netherlands)
For primary bibliographic entry see Field 5B.
W76-05058

RATES AND MECHANISMS OF CHEMICAL REACTIONS DURING FLOW OF SECONDARY TREATED SEWAGE EFFLUENT THROUGH POROUS BEDS,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 5D.
W76-05103

WATER FLOW THROUGH A MULTILAYER STRATIFIED HILLSIDE,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2F.
W76-05134

INFLUENCE OF SURFACE ACTIVE AGENTS ON MOVEMENT OF WATER IN SOIL,
Regional Inst. of Tech., Jamshedpur (India). Dept. of Chemistry.
D. N. Pathak.
Indian Journal of Technology, Vol. 13, No. 7, p 323-326, July 1975. 4 tab, 11 ref.

Descriptors: *Soil sealants, *Soil stabilization, *Soil treatment, *Permeability, Seepage, Soil water, Capillary action, Sands, Diffusivity, Soil water movement.
Identifiers: *India, Sodium laurate, Soapnut.

Surface active agents, such as soapnut and sodium laurate, have been found to suppress the movement of water in soil. Laboratory experiments with two grades of standard Ennore sands mixed with soapnut and sodium laurate in different proportions showed marked decreases in capillarity, permeability and diffusivity on which the movement of water in a soil mainly depends. A mixture containing 0.3% soapnut on 0.1% sodium laurate gave the best results. The preferential adsorption of colloidal particles formed by the surface active agent on coming in contact with water on the solid surfaces of the soil reduced the movement of water in the soil. (Bhowmik-ISWS)
W76-05154

THE USE OF A DEPENDENT DOMAIN MODEL OF HYSTERESIS IN NUMERICAL SOIL WATER STUDIES,
New South Wales Univ., Kensington (Australia). School of Engineering.
S. J. Lees, and K. K. Watson.
Water Resources Research, Vol. 11, No. 6, p 943-948, December 1975. 4 fig, 19 ref.

Descriptors: *Soil water movement, *Hysteresis, *Unsaturated flow, *Model studies, Numerical analysis, Soil water, Soil pressure, Soil moisture, Moisture content, Infiltration, Moisture tension, Subsurface waters, Recharge, Drainage effects, Mathematical models, Gravitational water.
Identifiers: *Domain models, *Draining curves, *Wetting curves, Finite difference models.

The analysis of intermittent soil water systems requires the inclusion of a capillary hysteresis model in the space-time simulation of the flow process. Domain models of hysteresis were reviewed, and the approach of Poulovassilis and Childs (1971) was selected as the basis for a numerical hysteresis program which enabled the generation of primary, secondary, and higher order scanning curves. The dependence of the pore draining pressure on the pressure at the previous reversal was restricted to reversals from the boundary curves. This enabled the distribution function to be approximated by a series of regularly spaced, independent domain-type distribution diagrams, each being derived from an experimental primary curve and a set of estimated secon

dary scanning curves. The effectiveness of the approach was demonstrated by simulating the movement of water in a profile of experimental sand subject to intermittent infiltration-redistribution sequences. In particular, the hysteretic path followed by the surface node was used to illustrate the generation of the necessary higher order scanning curves. (Prickett-ISWS)
W76-05158

TRANSFORMATIONS OF FLUXES AND FORCES DESCRIBING THE SIMULTANEOUS TRANSPORT OF WATER AND HEAT IN UNSATURATED POROUS MEDIA,
Agricultural Research Service, Riverside, Calif.
For primary bibliographic entry see Field 2F.
W76-05159

WATER ELUTION OF ORGANIC MATTER IN THE NORTHERN TAIGA FORESTS OF THE KOLA PENINSULA,
For primary bibliographic entry see Field 2K.
W76-05168

COMPARISON OF INORGANIC NITROGEN CONTENTS OF UNDISTURBED, CULTIVATED, AND BARNYARD SOIL PROFILES IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5B.
W76-05263

WATER FLUX AND ELECTRICAL POTENTIALS IN WATER-SATURATED BENTONITE,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
S. Gairon, and D. Swartzendruber.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 811-817, September-October 1975. 6 fig, 1 tab, 8 ref. OWRR B-005-IND(2).

Descriptors: *Zeta potential, Flow, *Hydraulic gradient, *Bentonite, Saturated flow, Clays, Seepage, Permeameters, Hydraulic properties, Hydraulic conductivity, Equipment, Laboratory tests, Hysteresis, Expansive clays.
Identifiers: *Clay-water mixtures, *Streaming potential, *Non-Darcian flow, Swelling clay, Double-layer theory, Electroosmotic back flux.

Electrical potential, water flux, and hydraulic gradient were studied for saturated water flow through plugs of sodium bentonite at concentrations ranging from 11.5 to 35.1% clay. A special permeameter with an adjustable piston allowed measurements to be taken with a given mass of clay, but with successively lower clay concentrations. At the lowest clay content, both electrical potential and water flux increased less than proportionally with increasing hydraulic gradient. This less-than-proportional behavior decreased as clay concentration increased, and, at 28.4% clay, proportional response to hydraulic gradient was obtained for both electrical potential and water flux. A less-than-proportional relationship between electrical potential and hydraulic gradient did not cause the water flux to increase more than proportionally with increasing hydraulic gradient, in contrast with what has been reported for non-swelling quartz powder and would be inferred from the classical double-layer theory of streaming potential and electroosmotic flow. The only indication of a more-than-proportional flux-gradient relationship was found for a 35.1% clay concentration, in the form of a linear relationship displaced to the right from the origin to yield a positive gradient intercept and a negative water flux at zero hydraulic gradient. (Visocky - ISWS)
W76-05269

AGRONIMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES (REPERCUSSIONS AGRONOMIQUES DES EPANDAGES D'EFFLUENTS DES INDUSTRIES AGRICOLES ET ALTIMENTAIRES),
Institut National de la Recherche A Agronomique, Versailles (France). Station Centrale d'Agronomie.
For primary bibliographic entry see Field 5D.
W76-05331

EXPERIMENTAL DETERMINATION OF SOIL MOISTURE ON IRRIGATED LANDS FROM RADIOACTIVE SOIL EMISSION,
N. V. Zotimov.
Soviet Hydrology, Selected Papers, No. 6, p 491-499, 1973. 1 fig, 1 tab, 4 ref, 3 append. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 207, p 88-93, 1973.

Descriptors: *Soil moisture, *Nuclear moisture meters, *Gamma rays, Radiation, Measurement, Instrumentation, Soil water, Soil moisture meters, Irrigation, Subsurface waters, Moisture, Crops, Agriculture.
Identifiers: *Radioactive soil emission, *USSR.

Successful solution of many practical agricultural production problems requires control of soil moisture dynamics. Obtaining operational data on soil moisture in fields under agricultural use is particularly important for determining irrigation times and rates. The relation between the intensity of the natural gamma radiation of the earth and soil moisture can be used for operational soil moisture determinations on irrigated land. The mean square measurement error of the average moisture content of the upper meter of the soil by the M-100 instrument with a scintillation detector is plus or minus 1% of absolute soil moisture, or plus or minus 3-4% of the relative field moisture capacity of Chernozemic soils. The gamma method of measuring the moisture content of soils from their natural radioactivity does not require soil sampling and laboratory analysis, the installation of sensors in the soil, making trenches in the soil, and the use of artificial radioactive sources. Therefore it increases work efficiency and makes it possible to obtain information on soil moisture directly in the field. (Sims-ISWS)
W76-05401

PREDICTING ANION MOVEMENT IN DISTURBED AND UNDISTURBED SOILS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
D. K. Cassel, M. T. Van Genuchten, and P. J. Wierenga.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1015-1019, November-December 1975. 6 fig, 22 ref.

Descriptors: *Anions, *Ion transport, *Soils, Cores, Laboratory tests, Tracers, Chlorine radioisotopes, Nitrates, Numerical analysis, Mathematical models, Equations, Convection, Diffusion, Nitrification, Soil water, Pore water, Velocity, Depth, Soil texture, Bulk density, Solutes, Loam, *Forecasting.
Identifiers: *Aberdeen loam, *Disturbed soils, *Undisturbed soils, Anionic exclusion, Breakthrough curve.

Prediction of anion displacement in soils has proven difficult owing to anion exclusion and the occurrence of anion sources or sinks within the soil system. In addition, variations in bulk density and texture with depth cause mean pore water velocity and soil water content to be functions of depth. A numerical solution of a modified convective diffusion equation, which accounts for apparent anion exclusion and variations in soil water content and mean pore water velocity as functions of depth, was discussed. Moreover, a zero-order rate term was incorporated to account for nitrification occurring in the upper portion of the soil profile. The model was tested using previously published NO3 and C136 displacement data for disturbed and undisturbed cores of Aberdeen loam. The model predicted C136 displacement well. Incorporation of the source term improved prediction of the nitrate breakthrough curve, but agreement of the predicted curve with observed data was only fair. When average values for water content and bulk density were used throughout the entire column, instead of depth dependent values, the description of anion movement was not as good. It was suggested, however, that the improvement in accuracy of prediction of anion displacement may be less than the variation in solute movement observed among replicate soil cores. (Visocky-ISWS)
W76-05402

LIQUID AND VAPOUR PHASE TRANSPORT IN SOILS,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
D. R. Scotter.
Australian Journal of Soil Research, Vol. 14, No. 1, p 33-41, February 1976. 6 fig, 26 ref.

Descriptors: *Soil water movement, *Water vapor, *Moisture content, *Diffusivity, Diffusion, Unsaturated flow, Clays, Sands.

Measurements, and calculations from desorption isotherms, for vapour and liquid phase flow in a loamy sand and a clay over a range of water content is reported. At some water contents the measured vapour diffusivities were up to an order of magnitude greater than the calculated values. The liquid and vapour diffusivities were found to be of comparable magnitude over a range of moisture contents. The measured component diffusivities at 298 K were used to calculate total diffusivities at other temperatures, and good agreement was found with measured values. (CSIRO)
W76-05409

COUPLED SOIL MOISTURE, HEAT AND WATER VAPOUR TRANSFERS UNDER SIMULATED FIRE CONDITIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
A. R. Aston, and A. M. Gill.
Australian Journal of Soil Research, Vol. 14, No. 1, p 55-66, February 1976. 9 fig, 22 ref.

Descriptors: *Burning, *Soil temperature, *Heat transfer, *Soil water movement, *Water vapor, Evaporation, Moisture content, Numerical analysis, Model studies, Laboratory tests.

An approximate numerical method is presented coupling the transfer of water, heat and water vapour in a soil. The system is used to predict in time, soil temperature profiles under simulated surface fire conditions. Moisture profiles, ground heat flux and soil evaporation are also calculated. An experiment using a tube of moist sand heated by a radiant heater was used to test the model. A further test was imposed using experimental grass fire data from the literature. In all cases deviations between observed and calculated results were small. (CSIRO)
W76-05410

A NOTE ON THE USE OF THE PHILIP INFILTRATION EQUATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles, and J. H. Knight.
Australian Journal of Soil Research, Vol. 14, No. 1, p 103-108, February 1976. 4 fig, 1 table, 10 ref.

Descriptors: *Graphical analysis, *Infiltration, Equations, Mathematical studies, *Soil water movement.
Identifiers: *Philip infiltration equation.

The suggestion is made that, where i is cumulative infiltration to a uniform soil at time t after ponding, data from infiltration experiments should be graphed with (i/square root of t) as a function of (square root of t), as a matter of course. Early-time linearity of this curve confirms the appropriateness during this time of Philip's two-parameter equation. The two parameters emerge as the intercept and slope of the line. If subsequently infiltration is described by the equation di/dt = K (the 'saturated' hydraulic conductivity), then this part will emerge as the asymptote of i = Kt. (CSIRO)
W76-05411

2H. Lakes

EFFECTS OF ARTIFICIAL DESTRATIFICATION ON POPULATIONS OF BENTHIC MACROINVERTEBRATES AND ZOOPLANKTON IN HAM'S LAKE AND ARBUCKLE RESERVOIR,
Oklahoma State Univ., Stillwater, School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-05017

AUTOMATED DETERMINATIONS OF DISSOLVED ORGANIC CARBON IN LAKE WATER,
Canada Center for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5A.
W76-05047

COMPARATIVE ATOMIC ABSORPTION SPECTROSCOPIC STUDY OF TRACE METALS IN LAKE WATER,
Limnetics, Inc., Milwaukee, Wis.
For primary bibliographic entry see Field 5A.
W76-05051

BOAT-GENERATED WAVES IN LAKES,
Illinois Univ. at Urbana-Champaign. Water Resources Center.
N. G. Bhowmik.
Journal of the Hydraulics Division, Proceedings American Society of Civil Engineers, Vol. 101, No. HY11, p 1465-1468, November 1975. 3 fig, 4 ref. OWRT A-069-ILL(1). USDI 14-31-0001-5013.

Descriptors: *Boating, *Lakes, *Waves(Water), *Illinois, Shores, Shore protection, Energy, Erosion, Erosion control, On-site investigations, Bank stabilization.
Identifiers: *Variance spectra, *Carlyle Lake(111), Wave heights.

Banks of waterways, canals, rivers, or lakes are sometimes exposed to detrimental effects by boat-generated waves. These banks are more vulnerable to any form of wave action whenever the stage is above normal pool elevation. A field study was conducted to gather information about waves produced by a moving boat at various distances from the shore. Statistical analysis indicated that the wave heights can be described to some extent by the Rayleigh distribution. Serial correlation analysis indicated no periodic variation in the boat-generated waves. Variance spectrum analysis indicated that as the distance between the moving boat and the shore diminishes, the exposed shore must dissipate a major portion of the wave energy in a very short period of time. It might be advisable to make a 100-ft (30.5m) strip close to the shore off-limits to high-speed pleasure crafts. This should minimize the damage to the shore by the boat-generated waves. Maximum wave heights can be related to the boat speed, the length of the boat, the distance between the boat and the wave gage, and the draft of the boat.
W76-05128

AN EFFICIENT TRANSITION DEFINITION FOR DISCRETE STATE RESERVOIR ANALYSIS: THE DIVIDED INTERVAL TECHNIQUE,
New South Wales Univ., Kensington (Australia). School of Civil Engineering; and New South Wales Univ., Kensington (Australia). Dept. of Water Engineering.
For primary bibliographic entry see Field 4A.
W76-05161

THE EFFECTS OF A MARSH ON WATER QUALITY,
Hope Coll., Holland, Mich. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-05182

NUTRIENT DYNAMICS AND GAS PRODUCTION IN AQUATIC ECOSYSTEMS: THE EFFECTS AND UTILIZATION OF MERCURY AND NITROGEN IN SEDIMENT-WATER MICROCOSMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W76-05246

NATURALLY OCCURRING ORGANIC COMPOUNDS AND ALGAL GROWTH IN A EUTROPHIC LAKE,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W76-05253

ZOOPLANKTON FORMATION IN THE OCHER BAY OF THE VOTKINSK RESERVOIR, (IN RUSSIAN),
Perm State Univ. (USSR). Natural Sciences Inst.
R. A. Serkina.
Gidrobiol Zh. 10(5): 42-48, 1974.

Descriptors: *Zooplankton, *Reservoirs, Bays, Biomass, Plankton, *Fish food organisms, Fry, Fish, *Coustaceans.
Identifiers: *USSR(Votkinsk Reservoir), Ocher Bay.

Changes in zooplankton of the Ocher river (USSR) (the right tributary of the Kama) are caused by backwater in connection with formation of the reservoir. The process of zooplankton formation in the bay is similar to that in the central part of the reservoir. There was mass development of Cladocera for the 1st 2 yr of the reservoir's existence, then a decrease and, by the 6th yr, a 13-20-fold increase in a summer biomass as compared to the center of the reservoir. The bay, uncontaminated and rich in plankton, supplies food for fish fry.--Copyright 1975, Biological Abstracts, Inc.
W76-05274

THE CAUSE OF TROUT FISH KILLS OCCURRING IN THE WATER FROM THE AERATED HYPOLIMNION OF DEEP LAKES,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
For primary bibliographic entry see Field 5C.
W76-05325

BACTERIAL POLLUTION IN LAKE BURLEY GRIFFIN,
Royal Military Coll., Duntroon (Australia). Dept. of Geography.
For primary bibliographic entry see Field 5C.
W76-05407

EFFECTS OF AIR INJECTION AT PROMPTON LAKE, WAYNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5G.
W76-05413

CHEMICAL QUALITY AND TEMPERATURE OF WATER IN FLAMING GORGE RESERVOIR, WYOMING AND UTAH, AND THE EFFECT ON THE RESERVOIR ON THE GREEN RIVER,
Geological Survey, Salt Lake City, Utah.
E. L. Bolke, and K. M. Waddell.
Water-Supply Paper 2039-A, 1975. 26 p, 8 fig, 1 plate, 1 tab, 9 ref.

Descriptors: *Water quality, *Water temperature, *Reservoirs, *Wyoming, *Utah, Hydrologic data, Pre-impoundment, Post-impoundment, Inflow, Discharge(Water), Water chemistry, Chemical analysis, Anaerobic conditions, Dissolved solids, Thermal properties, Epilimnion, Hypolimnion, Limnology.
Identifiers: *Flaming Gorge Reservoir(Wyo and Utah), Green River.

The major tributaries to Flaming Gorge Reservoir (Wyoming and Utah) contribute an average of about 97 percent of the total streamflow and 82 percent of the total load of dissolved solids. The Green River is the largest tributary, and for the 1957-72 water years it contributed 81 percent of the total streamflow and 70 percent of the total load of dissolved solids. The principal constituents in the tributary streamflow are calcium and sulfate during periods of lowest flow and calcium and bicarbonate during periods of highest flow. Flaming Gorge Dam was closed in November 1962, and the most significant load changes of chemical constituents due to the net effect of inflow, outflow, leaching, and chemical precipitation in the reservoir have been load changes of sulfate and bicarbonate. The average increase of dissolved load of sulfate in the reservoir for the 1969-72 water years was 110,000 tons per year, which was 40,000 tons per year less than for the 1963-66 water years. The average decrease of dissolved load of bicarbonate in the reservoir for 1969-72 was 40,000 tons per year, which was the same as the decrease for 1963-66. Anaerobic conditions were observed in the deep, uncirculated part of the reservoir near the dam during the 1971 and 1972 water years. The water in the reservoir is in three distinct layers, and the upper two layers (the epilimnion and the metalimnion) mixed twice during each of the 1971-72 water years. The two circulation periods were in the spring and fall. The water in the deepest layer (the hypolimnion) did not mix with the waters of the upper zones. Prior to closure of the dam, the average monthly temperature of the green River below the damsite ranged from 0 deg C to 19.5 deg C as compared to 3.5 deg C to 10.0 deg C after closure. (Woodard-USGS)
W76-05417

USER PREFERENCES OF POLICY ALTERNATIVES: THE CASE OF RECREATIONAL USER ATTITUDES TOWARD DEVELOPMENT AND REGULATION AT LAKE MONROE, INDIANA,
Indiana Univ., Bloomington. Poplars Research and Conference Center.
For primary bibliographic entry see Field 6B.
W76-05435

ZOOPLANKTON OF SOME INLAND WATERS OF THE DAGESTAN ASSR., (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Makhachkala (USSR).
L. P. Lazareva.
Gidrobiol Zh. 10(5): 88-90, 1974.

Descriptors: Zooplankton, *Crustaceans, Inland waterways, Fish, *Rotifers, *Copepods, Lakes, Ponds, Fish hateris, *Fish food organisms.
Identifiers: Copepod, *USSR(Dogestan-ASSR).

Data are presented on the average seasonal biomass of zooplankton (rotifers, cladocerans, copepods) of Lake Ak-Gel, Lake Temirgoe and hatchery ponds of Lake Mekteb (Russian SFSR, USSR), differing in size, physicochemical conditions and fish composition. Copyright 1975, Biological Abstracts,Inc.

6-05444

ME PHYSICAL FACTORS AS THE OLOGICAL BACKGROUND IN THE PELA-AL OF THE SOSNOWICKIE LAKES,
rsaw Univ. (Poland). Zaklad Microbiologica dy Sci.
primary bibliographic entry see Field 5C.
6-05474

LE OF CALCIUM CARBONATE ECIPITATION IN LAKE METABOLISM,
higan State Univ., East Lansing. Dept. of any.
S. White.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as C00-159 980, 5 in paper copy, $2.25 in microfiche. PhD thes-1974. 154 p. 37 fig, 8 tab, 107 ref.AEC AT (11-599, C00-1599, NSF GB-15665.

criptors: *Calcium carbonate, *Sedimentation, kes, *Metabolism, Michigan, Lake sediments, ton, Hardness(Water), Organic matter, Calci- Productivity, Phosphorus, Nitrogen, Carbon, imentation rates, Iron, Phytoplankton, min B.
ntifiers: *Lawrence Lake(Mich), Ash sedimen-on, Vitamin B-12.

imenting seston was collected during 1972 and 3 in improved sediment traps in Lawrence e, Michigan, a small hardwater lake. Organic ter and ash sedimentation rates were similar n years, but the calcium carbonate precipita- rate was five times greater in 1973. This dis-larity in calcium carbonate precipitation was ted to the degree of vernal circulation and cal-n ion concentration in the water column when ice broke up. Colloidal calcium was present all . The average amount of suspended calcium onate was 36.7 mg/1. Scanning electron micro-hs of seston collected at 10 m showed an or-c matrix covering all material and clogging r pores. Total phosphorus sedimentation wed marked displacement into the metalimnion hypolimnion when decalcitication was severe the epilimnion. The amount of material spended from the lake bottom varied with ngth and duration of vernal and autumnal ds. Nitrogen and particulate organic carbon mentation rates were relatively constant and ely related to phytoplankton activity in the hogenic zone. No direct adsorplion of iron calcium carbonate particles was suggested by ratory experiments, but calcium carbonate iron precipitation rates were influenced by the ence of organic compounds. Vitamin B-12 was oved with precipitating calcium carbonate. hanan-Davidson--Wisconsin)
-05480

Water In Plants

KERY BAY LAND USE STUDIES, EN-ONMENTAL PLANNING STRATEGIES THE DEVELOPMENT OF A MANGROVE RELINE, STUDY NO. 5, ESTUARINE LOGY,
servation Foundation, Washington, D. C.
primary bibliographic entry see Field 5G.
-05006

ER ELUTION OF ORGANIC MATTER IN NORTHERN TAIGA FORESTS OF THE A PENINSULA,
primary bibliographic entry see Field 2K.
-05168

IRONMENTAL ANALYSIS OF WATER OURCES DEVELOPMENT IN THWESTERN NORTH DAKOTA,
inson State Coll., N. Dak.
For primary bibliographic entry see Field 6G.
W76-05351

2J. Erosion and Sedimentation

BOAT-GENERATED WAVES IN LAKES,
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 2H.
W76-05128

MEASUREMENT OF HYDROCARBONS IN WATER AND SEDIMENT,
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
For primary bibliographic entry see Field 5A.
W76-05144

FLUME STUDY OF KNICKPOINT DEVELOPMENT IN STRATIFIED SEDIMENT,
Sydney Univ. (Australia). Dept. of Geography.
W. N. Holland, and G. Pickup.
Geological Society of America Bulletin, Vol. 87, No. 1, p 76-82, January 1976. 8 fig, 2 tab, 6 ref.

Descriptors: *Flumes, *Erosion, Geomorphology, Sedimentation, Sediments, Discharge(Water), Hydraulics, Degradation(Stream), Channel erosion, Channels.
Identifiers: *Flume experiments, *Stratified sediment, Knickpoints, Longitudinal profiles, Cohesive sediment, Retreat rate.

In a flume study of knickpoint development in stratified sediment, two thin sand beds were intercalated between beds of cohesive material. The sand beds acted as knickpoint-forming horizons on which stepped knickpoints were developed and maintained as they moved upstream, creating an apparently stable form consisting of a channel-in-channel system. The system had four basic elements: (1) an aggraded reach upstream of the knickpoint, terminating on the downstream end at a fill-incision transition zone; (2) an oversteepened reach just above the knickpoint face; (3) the knickpoint face; and (4) an incising reach, often covered by moving sediment between successive knickpoints. Apparently the presence of a knickpoint-forming horizon reduces knickpoint retreat rates, which were much lower in this study than those observed in an experiment with cohesive material but no intercalated sand beds and a similar discharge. Also, the channel-in-channel system that results from stratification is apparently fairly insensitive to the effects of changing deischarge. (Lee -ISWS)
W76-05162

BEACH CUSPS FORMED BY INTERSECTING WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-05163

RIVERS OF THE PAST: CREATORS OF OIL,
G. V. Obediyentova.
Available from the National Technical Information Service, Springfield, Va, 22161, as N75-10517, $3.50 in paper copy, $2.25 in microfiche. Translated from Russian; Source Publication not given, 22 p, 9 fig, 7 ref.

Descriptors: *Rivers, *Paleohydrology, *Sedimentary petrology, *Oil, Hydrology, Sedimentation, Humus, Alluvium, Deltas, Geology, Hydrogeology.
Identifiers: *USSR, *Volga River(USSR).

The processes were described by which the ancient Volga worked to create the so-called productive strata which contains petroleum. Sediments and humus were carried by the Paleovolga, and created the alluvial deposits at its delta, which have become oil bearing rock formations. (Sims-ISWS)
W76-05166

EFFECTS OF LAND USE AND RETENTION PRACTICES ON SEDIMENT YIELDS IN THE STONY BROOK BASIN, NEW JERSEY,
Geological Survey, Ithaca, N.Y.
For primary bibliographic entry see Field 4C.
W76-05418

2K. Chemical Processes

GEOHYDROLOGY OF KARST TERRAIN, LOST RIVER WATERSHED, SOUTHERN INDIANA,
Indiana Univ., Bloomington, Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W76-05004

EVALUATION OF WATER LABORATORIES, RECOMMENDED BY THE UNITED STATES PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C. Bureau of State Services.
For primary bibliographic entry see Field 5G.
W76-05041

INTERFERENCES IN THE ELECTROANALYTICAL DETERMINATION OF COPPER AND LEAD IN WATER AND WASTE WATER,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-05045

POTABLE WATER QUALITY IN RURAL GEORGETOWN COUNTY,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-05050

COMPARATIVE ATOMIC ABSORPTION SPECTROSCOPIC STUDY OF TRACE METALS IN LAKE WATER,
Limnetics, Inc., Milwaukee, Wis.
For primary bibliographic entry see Field 5A.
W76-05051

MODEL 6-D IN-SITU WATER QUALITY ANALYZER (SURVEYOR) HYDROLAB CORPORATION, AUSTIN, TEXAS 78766.
National Oceanic and Atmospheric Administration, Washington, D. C.; and National Ocean Survey, Rockville, Md.
For primary bibliographic entry see Field 5A.
W76-05091

QUALITY OF WELL-WATERS OF NORTHERN MADHYA PRADESH,
College of Agriculture, Parbhani (India).
For primary bibliographic entry see Field 4B.
W76-05146

PARTITIONING OF HYDROCARBONS BETWEEN THE ATMOSPHERE AND NATURAL WATERS,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5B.
W76-05149

WATER ELUTION OF ORGANIC MATTER IN THE NORTHERN TAIGA FORESTS OF THE KOLA PENINSULA,
K. N. Manakov.
Available from the National Technical Information Service, Springfield, Va, 22161, as N75-10519, $3.50 in paper copy, $2.25 in microfiche. NASA Technical Translation F-15,981, October 1974. 22 p, 3 fig, 6 tab, 13 ref. Translated from Pochvennye Rezhimy na Polyarnom Severe. Nauka, Leningrad, 1969.

Descriptors: *Forests, *Forest soils, *Organic matter, *Groundwater movement, Soil water movement, Organic compounds, Coniferous forests, Nutrients, Vegetation, Forest watersheds, Biology, Biological communities, Biochemistry.
Identifiers: *Northern taiga forests(USSR), *Kola Peninsula(USSR), *USSR.

The northern taiga coniferous forests of the Kola Peninsula are characterized by overall reduced productivity of the vegetative biomass compared with the typical and southern taiga. In the northern taiga, shrub and lichen-moss cover exhibiting low ash content play a major role in the ground cover. Here soil formation is characterized by the predominance of illuvial-humic podzolic (eluvial landscapes) and podzolic-boggy (superaqueous landscapes) processes. In this article, an attempt was made to present the general pattern of the migration of the primary elements in landscapes based on theoretical considerations and to compare available data on the chemical composition of soils, soil-forming rocks, vegetation, and soil-ground water. In the distinctive conditions of the northern taiga of the Kola Peninsula favorable conditions exist for the water elution of mineral elements: an adequate influx of atmospheric precipitation into the landscape, good water permeability of the soil-forming rocks, and acidic reaction of the soil solutions, promoting the dissolution of low-active compounds. A powerful factor counteracting the water elution of active elements, but even deficient supply for plants, is the intense biological absorption of substances by organisms. (Sims-ISWS)
W76-05168

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER - PHASE II,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8G.
W76-05180

SALT AND NONELECTROLYTE INTERACTIONS IN WATER,
Pittsburgh Univ., Pa. Dept. of Chemistry.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 773, $5.00 in paper copy, $2.25 in microfiche. OWRT/S-76/13, (1976). 87 p, 6 fig, 44 tab, 88 ref.

Descriptors: Desalination, Analytical techniques, Ions, *Nuclear magnetic resonance, Volumetric analysis, Cations, Sodium, Solvents.
Identifiers: *Salt-water-organic solutions, Sodium-23, *Ligands, *Ion-ligand interactions, *Titration calorimetry, *Ion pairing.

The sodium-23 NMR chemical shift of Na tetraphenylboron was measured in a variety of solvents and ligands.The shifts and line widths were correlated with a number of electron-donor properties of the same materials to see whether Na-23 NMR was a useful probe of ion-ligand interactions. Correlations were poor for Na-23 shifts in pure ligand solvents and not much better for dilute acetone solutions of the ligand containing Na tetraphenylboron. Normalized values in acetone solution gave better correlations. Of all electron donor properties, the ability of a solvent to accept hydrogen-bonds correlates best with its interaction with Na+ as measured by the Na-23 shift. Water as a bulk solvent is a much better sodium ion solvator than water in dilute acetone solution, but there is no evidence for long-lived hydrates in solution. Cellulose acetate in acetone causes a shift of the Na-23 resonance and considerable line-broadening suggesting the presence of relatively long-lived complexes similar to the behavior of crown ethers or glyme solvents. Titration calorimetry was used to determine K, delta G, delta H and delta S for the formation of ion-pairs and also ion-ligand complexes. The ion pair data show behavior closely parallel to conductance data but with consistent differences suggesting that calorimetry measures a wider range of ion-ion interactions than conductance. Measurements for ion-ligand interactions with pure solvents, crown ethers and glymes generally support previous data with a cruder solution calorimeter.
W76-05245

PREDICTING ANION MOVEMENT IN DISTURBED AND UNDISTURBED SOILS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-05402

CHEMICAL SORTING EFFECT AT THE BASE OF AN ALPINE GLACIER,
Brussels Univ. (Belgium). Laboratoire de Geomorphologie.
For primary bibliographic entry see Field 2C.
W76-05403

STRATIGRAPHIC AND HYDROLOGIC RELATIONSHIP OF THE PINEY POINT AQUIFER AND THE ALLOWAY CLAY MEMBER OF THE KIRKWOOD FORMATION IN NEW JERSEY,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 2F.
W76-05412

CHEMICAL QUALITY AND TEMPERATURE OF WATER IN FLAMING GORGE RESERVOIR, WYOMING AND UTAH, AND THE EFFECT ON THE RESERVOIR ON THE GREEN RIVER,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2H.
W76-05417

WATER RESOURCES OF BASINS FOR MINOR STREAMS DRAINING INTO ST. CLAIR RIVER, LAKE ST. CLAIR, DETROIT RIVER, AND LAKE ERIE, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-05427

WATER RESOURCES OF THE MISSISSIPPI AND SAUK RIVERS WATERSHED, CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-05428

WATER RESOURCES OF THE HURON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Grayling, Mich.
For primary bibliographic entry see Field 7C.
W76-05429

DISTRIBUTION OF DIFFERENT QUALITIES OF UNDERGROUND WATERS IN REWARI TEHSIL OF HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 3C.
W76-05432

2L. Estuaries

ROOKERY BAY LAND USE STUDIES, EN VIRONMENTAL PLANNING STRATEGIE FOR THE DEVELOPMENT OF A MANGROV SHORELINE, STUDY NO. 3, ESTUARIN WATER QUALITY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05005

ROOKERY BAY LAND USE STUDIES, EN VIRONMENTAL PLANNING STRATEGIE FOR THE DEVELOPMENT OF A MANGROV SHORELINE, STUDY NO. 5, ESTUARIN BIOLOGY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05006

ROOKERY BAY LAND USE STUDIES, EN VIRONMENTAL PLANNING STRATEGIE FOR THE DEVELOPMENT OF A MANGROV SHORELINE, STUDY NO. 7, POLICY AN REGULATORY DIMENSIONS,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05007

ROOKERY BAY LAND USE STUDIES, EN VIRONMENTAL PLANNING STRATEGIE FOR THE DEVELOPMENT OF A MANGROV SHORELINE, STUDY NO. 9, PRINCIPLES O ECOSYSTEM MANAGEMENT,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05008

ROOKERY BAY LAND USE STUDIES, EN VIRONMENTAL PLANNING STRATEGIE FOR THE DEVELOPMENT OF A MANGROV SHORELINE, STUDY NO. 10, GROWTH AN LAND USE, STUDY NO. 11, ECONOMIC IM PLICATIONS OF LAND DEVELOPMENT A TERNATIVES, STUDY NO. 12, A SIMULATIO MODELING APPROACH TO THE STUDY O DEVELOPMENT ALTERNATIVES,
For primary bibliographic entry see Field 5G.
W76-05009

NUMERICAL SIMULATION OF SALT-WATE INTRUSION IN COASTAL AQUIFERS, PART
Princeton Univ., N. J. Dept. of Geological a Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05010

NUMERICAL SIMULATION OF SALT-WATE INTRUSION IN COASTAL AQUIFERS, PART
Princeton Univ., N. J. Dept of Geophysi Sciences.
For primary bibliographic entry see Field 5B.
W76-05011

WATER POWER MACHINE AND UNDERSE UNDER WATER GENERATOR STATION,
For primary bibliographic entry see Field 8C.
W76-05039

SEASONAL OCCURRENCE AND DISTRIB TION OF MICROBIAL INDICATORS AN PATHOGENS IN THE RHODE RIVER C CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. Microbiology.
For primary bibliographic entry see Field 5B.
W76-05052

RETREATMENT AND ULTIMATE DISPOSAL
F WASTEWATER SOLIDS,
nvironmental Protection Agency, New York. Re-
on II.
or primary bibliographic entry see Field 5D.
76-05079

XPANSION OF SALT-WATER ZONE DUE TO
ELL DISCHARGE,
orth Carolina State Univ., Raleigh. Dept. of Civil
ngineering.
A. I. Kashef, and J. C. Smith.
ater Resources Bulletin, Vol. 11, No. 6, p 1107-
20, December 1975. 7 fig, 2 tab, 10 ref. OWRT
4061(No. 9013) (4)

escriptors: *Saline water-freshwater interfaces,
Water wells, *Saline water intrusion, Coasts,
quifers, Pumping, Aquifer characteristics, Com-
ter models, Water management(Applied),
oundwater movement, Hydraulic conductivity,
ecific weight, Potentiometric level, Equations,
atural flow, Theis equation, Storage coefficient,
oundwater, Saline water, Wells.
entifiers: *Upconing, Dimensionless solutions,
ell location, Pump capacity.

coastal confined aquifers, the extent of salt-
ter wedge due to natural groundwater flow can
determined by available methods. If water is
mped by a discharge well, the quality of the
ter depends upon the rate and duration of
mping as well as the location of the well. A
dy was made to find the extent of the progress
salt-water intrusion due to the operation of one
charge well, taking into account various condi-
ns of aquifer properties, pump capacities, natu-
flow, time effects, and well locations. Dimen-
nless solutions for specific conditions were ob-
ned by means of a simple computer program.
nge of most common conditions was discussed.
e of the main findings of the study was that salt
ter may be pumped out of a well even if it is
ated in an initially totally fresh-water zone
yond the natural salt/fresh-water interface.
isocky-ISWS)
76-05133

CKGROUND PAPERS FOR A WORKSHOP
INPUTS, FATES, AND EFFECTS OF
TROLEUM IN THE MARINE ENVIRON-
ENT, VOLUME I.
tional Research Council, Washington, D.C.
can Affairs Board.
r primary bibliographic entry see Field 5B.
76-05135

TROLEUM INPUTS TO THE MARINE EN-
RONMENT FROM LAND SOURCES,
gineering-Science, Inc., Berkeley, Calif
primary bibliographic entry see Field 5B.
6-05140

TIMATES OF ANNUAL INPUT OF
TROLEUM TO THE MARINE ENVIRON-
NT FROM OFFSHORE PRODUCTION
ERATIONS,
xon Production Research Co., Houston, Tex.
logic Research.
primary bibliographic entry see Field 5B.
6-05142

ACH CUSPS FORMED BY INTERSECTING
VES,
aware Univ., Newark. Dept. of Civil Engineer-
A. Dalrymple, and G. A. Lanan.
logical Society of America Bulletin, Vol. 87,
1, p 57-60, January 1976. 2 fig, 2 tab, 25 ref.
R N00014-69-A-407.

criptors: *Beaches, *Waves(Water),
rrents(Water), Geology, Geomorphology,
Marine geology, Rip currents, Erosion, Wave pile-up, Laboratory tests, Water circulation, Hydraulics.
Identifiers: *Beach cusps, *Intersecting waves, Cusp formation, Wave patterns.

From the time when theories were first postulated on beach cusps, intersecting wave trains have been mentioned as one possible mechanism for cusp formation. However, this mechanism has been largely ignored, and no real effort has been made to understand it since Branner's work in 1900. It can be experimentally shown that rip currents, generated by intersecting waves of the same length, can create beach cusps of a known periodicity that depends on the wave length and the angle between the intersecting wave trains. (Lee - ISWS)
W76-05163

NEWFOUNDLAND'S CASE ON OFFSHORE MINERALS: A BRIEF OUTLINE,
Newfoundland Ministry of Mines and Energy, St. John's.
For primary bibliographic entry see Field 6E.
W76-05196

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT,
Coastal Zone Management Inst., Sandwich, Mass.
For primary bibliographic entry see Field 6B.
W76-05204

EXTENSION OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972.
For primary bibliographic entry see Field 5G.
W76-05209

DISTRIBUTION OF NUTRIENTS IN LOUISIANA'S COASTAL WATERS INFLUENCED BY THE MISSISSIPPI RIVER,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 5B.
W76-05259

THE TRI-STATE COASTAL ZONE MANAGEMENT PERSPECTIVES.
Tri-State Regional Planning Commission, New York.
For primary bibliographic entry see Field 6G.
W76-05260

WESTERNPORT BAY ENVIRONMENTAL STUDY 1973-1974.
Victoria Ministry for Conservation, Melbourne (Australia). Westernport Bay Environmental Study.
For primary bibliographic entry see Field 6G.
W76-05404

A METHOD FOR APPLYING RESEARCH TO ENVIRONMENTAL PLANNING AND MANAGEMENT: A CASE STUDY OF ISSUES IMPORTANT TO THE CHESAPEAKE BAY REGION,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W76-05434

EXPERIMENTAL TRANSPLANTATION OF THE CLAM MERETRIX CASTA (CHEMNITZ) IN THE MARINE FISH FARM,
Udaipur Univ. (India). Dept. of Zoology.
V. S. Durve.
Indian J Fish. Vol 20 No. 1: p 56-60 1973 Illus.

Descriptors: *Clams, Estuaries, Fish farming.
Identifiers: Meretrix Casta, Transplantation Athankarai estuary(India).

Several hundred clams M. casta (Chemnitz) obtained from Athankarai estuary on Oct. 28, 1964, were transplanted in the pond of the fish farm of the Central Marine Fisheries Research Institute, Mandapam Campl (India). During the period of study extending over 6 mo. there was an initial high rate of growth in the seed clams immediately on transplantation. However, this rate of growth declined, first slowly and then rapidly, after 5 mo. Probable causes for this uneven growth are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-05447

EFFECT OF SALINITY ON THE SURVIVAL AND REPRODUCTIVITY OF OLIGOCHAETES OF THE FAMILY TUBIFICIDAE OF THE DNIEPER-BUG ESTUARY, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-05454

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS MEMBRANE,
Department of the Interior, Washington, D.C. Office of the Secretary.
J. E. Cadotte.
U.S. Patent No. 3,926,798, 4 p, 4 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1331, December 16, 1975.

Descriptors: *Patents, *Water purification, Water quality control, *Desalination, *Reverse osmosis, *Membranes, Membrane processes, Separation techniques, Desalination apparatus, Thin films, *Waste water treatment.

Reverse osmosis membranes having excellent flux and salt rejection properties, as well as freedom from compaction or degradation, may be prepared by coating a microporous support with an aqueous solution of furfuryl alcohol and an acid catalyst, followed by heating to polymerize the furfuryl alcohol. This results in formation of a highly selective barrier on the surface of the support. The porous support may be any of the types conventionally used in reverse osmosis processes. Sulfuric acid has been found to be particularly effective as the acid catalyst. However, any acid catalyst capable of polymerizing the furfuryl alcohol may be used. It has been found that the acid catalyst, in addition to catalyzing the polymerization reaction, is to some degree incorporated into the product, thereby providing acidic groups in the membrane. These acidic groups are believed to provide hydrophylic sites in the membranes, thereby enhancing their performance in reverse osmosis processes. An additional consequence of the presence of the presence of the acidic groups in the membrane is that performance of the membrane is effected by the type of salts in the feed water. Feed solutions containing only monovalent cations will tend to swell the membrane and produce higher flux, while those containing polyvalent cations will inhibit swelling, thereby lowering the flux but producing maximum salt rejection. (Sinha-OEIS)
W76-05029

DEVICE FOR MEMBRANE FILTRATION,
Industriele Onderneming Wavin, N.V., Zwolle (Netherlands).
For primary bibliographic entry see Field 5F.
W76-05037

DESIGN AND SPECIFICATION BID PACKAGE, 10,000 GPD EUTECTIC FREEZE PILOT PLANT.
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
Available from the National Technical Information Service, Springfield Va 22161, as PB-250 455, $6.00 in paper copy, $2.25 in microfiche. OWRT/S--76/18, March 1975. 121 p, 12 fig, 64 specification sheets. OWRT 14-30-3277.

Descriptors: *Desalination plants, *Cystallization, Slurries, Refrigeration, *Freezing, *Specifications, *Design criteria, *Pilot plants, *Design standards, Evaporation.
Identifiers: *Eutectic freezing, Hydrocyclones, Direct contact evaporation, Refrigerant R-114.

Technical Specifications for a 10,000 GPD Eutectic Freeze Pilot Plant are presented. Engineering design criteria, process requirements, mechanical designs, fabrication and erection, and quality of workmanship for the pilot plant are established. Compliance with the above may include, but not be limited to, routing, sizing, material selection for piping and instrument control schemes for plant operation. Required arrangement of the pilot plant and instrumentation and controls needed to operate the system are shown on incorporated drawings as is the process flow diagram.
W76-05178

THE COLORADO RIVER SALINITY PROBLEM WITH MEXICO,
For primary bibliographic entry see Field 5G.
W76-05194

THERMODYNAMIC OF SALT SOLUTIONS AND GEOTHERMAL BRINES AT ELEVATED TEMPERATURES.
Westinghouse Research Labs., Pittsburgh, Pa.
C. T. Liu.
Available from the National Technical Inormation Service Springfield,Va 22161, as PB-250733, $5.00 in paper copy, $2.25 in microfiche. OWRT/S-76/19 71 p 17 fig, 7 tab, 21 ref, 2 append. 14-302918.

Descriptors: *Thermodynamics, *Saline water, *Geothermal studies, Brines, *Vapor pressure, Boilng, *Desalination.
Identifiers: *Osmotic Coefficients, *Boiling point elevation, *Vapor pressure cells, Water Activity.

Vapor pressure lowering measurements of synthetic geothermal brines have been carried out at temperatures from 75 to 250C with three concentrations ranging from one-to four-fold concentrates of hot-water type geothermal chemical systems. Osmotic coefficients and boiling point elevations of the brine solutions have been obtained; these are compared with the better known data for sodium chloride and the less extensive data for saline water concentrates. The results are discussed in terms of the structural aspect of ion-solvent interaction and ion association. As temperature increases, the individual ionic character of both synthetic geothermal salt and simulated sea salt brines starts to diminish; these results can be explained by ion association which becomes more favorable for divalent ions at higher temperatures. The mixture osmotic coefficient is a function of several variables in a four-ion system. Three examples are cited to illustrate such a geometrical model. The composition axes are measures of the relative contributions of the cationic and anionic constituents to ionic strength. Knowledge of the osmotic coefficient surface for this system is incomplete.
W76-05244

SALT AND NONELECTROLYTE INTERACTIONS IN WATER,
Pittsburgh Univ., Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W76-05245

WATER PURIFICATION TECHNOLOGIES, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W76-05291

WASTE-TREATMENT APPLICATIONS OF REVERSE OSMOSIS,
General Atomic Co., San Diego, Calif. Roga Systems Div.
For primary bibliographic entry see Field 5D.
W76-05294

MEETING EPA STANDARDS WITH REVERSE OSMOSIS,
Universal Oil Products Co., Del Mar, Calif. Roga Div.
For primary bibliographic entry see Field 5D.
W76-05295

REVERSE OSMOSIS IN INDUSTRIAL WATER TREATMENT,
Permutit Co., London (England).
For primary bibliographic entry see Field 5D.
W76-05296

SALINE WATER CONVERSION ENGINEERING DATA BOOK - 1975.
Kellogg (M. W.) Co., Piscataway, N. J.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 907 $18.75 in paper copy, $2.25 in microfiche. OWRT/s -- 1976, (Special 07 updated), October 1975, 730 p. 14-30-3121.

Descriptors: *Saline water, *Desalination processes, Waste water treatment, *Data collections, Demineralization, Membrane processes, Dialysis, Electrodialysis, Osmosis, Reverse osmosis, Distillation, Freezing, Seawater, Towers, Dearation, Desalination apparatus, Equipment, Chemistry, Thermal conductivity, Thermodynamic behavior, Physical properties, Equilibrium, Hydrate processes, *Design standards, Economic efficiency.
Identifiers: Liquid-liquid spray towers, Seawater dearators, Conversion tables, *Engineering data, *Data books, Flow diagrams.

Information is presented on physical properties of chemicals and selected materials, derived thermodynamic data, phase equilibria, equipment cost and economic factors, design methods and standards for saline water conversion. Sample calulations on pressure drop in two phase flow, process flow diagrams for distillation, freezing, reverse osmosis and electrodialysis are included. Design of seawater deaerators, liquid-liquid spray towers and, seawater chemistry are discussed.
W76-05347

GUIDE TO THE COSTING OF WATER FROM NUCLEAR DESALINATION PLANTS,
Applied Research and Engineering Ltd., Durham (England).
R. Starmer, and F. Lowes.
International Atomic Energy Agency, Vienna, Technical Reports Series No. 151, 1973. 87 p 44 fig, 13 tab, 6 ref, 2 append.

Descriptors: *Steam, *Water costs, *Nuclear reactors, *Desalination plants, *Cost analysis, Estimated costs, Equipment, Flash distillation, Electric power production, Electric power costs, Computer programs, Capital costs, Turbines, Boilers, Design, Fossil fuels, Evaporators, Electric powerplants.
Identifiers: Dual-purpose plants.

Methods enabling realistic water costs to be determined for water produced from nuclear-powered dual-purpose systems are presented, using up-to-date cost data. The British Nuclear Design and Construction Ltd. supplied current steam costs from nuclear heat sources. To assess price validity of desalination plant equipment, escalation o U.K. commodities and labor costs were given Costs are given so that future cost escalation could be estimated. Costs are presented in a serie of cost breakdowns and performance curves. Cos estimates of electric power generated and lo pressure steam exhausted to the distillation plan heat input section can be made. A computer pro gram was used to estimate water cost for variou conditions and cases and the minimum water co for selected capital charge rates. Turbine pe formance figures are plotted so that for a given in tial steam condition, power produced by steam e panding in the turbine to a specified back pressur can be determined. From data in the curve presented, water costs, electricity costs, an power produced can be determined for an selected water requirement and heat sourc (nuclear or fossil). Multistage flash distillatio plants are evaluated to determine water costs. E amples are given and suggestions made for obtai ing accurate estimates in special situation (Buchanan-Davidson--Wisconsin)
W76-05436

3B. Water Yield Improvement

AN INTERNATIONAL CENTRE FO MANATEE RESEARCH.
National Academy of Sciences, Washington, D.C
For primary bibliographic entry see Field 4A.
W76-05433

CONTROL OF AQUATIC VEGETATION NEW YORK STATE,
New York State Coll. of Agriculture and Li Sciences.
For primary bibliographic entry see Field 5C.
W76-05467

MECHANICAL MANAGEMENT OF AQUAT VEGETATION: ANALYTICAL STUDIES UNIT OPERATIONS POTENTIALLY USEFU IN THEIR PROCESSING,
Wisconsin Univ., Madison. Dept. of Mechani Engineering.
S. E. Sy.
PhD thesis, 1974. 239 p. 34 fig., 25 tab., 44 ref. append.

Descriptors: *Aquatic weed control, *Mechani control, *Dewatering, *Separation techniqu Wisconsin, Pressure, Moisture content, Forag Chemical analysis, Mathematical mode Proteins, Calcium, Fibers(Plants), Feeds, Poult Fertilizers, Mulching.
Identifiers: *Eurasian watermilfoil, *Dane Cou ty(Wis.), *Solid-Liquid separation process Screw press, Xanthophyll.

Mechanical dewatering and solid-liquid separati methods for reducing harvested Eurasian wat milfoil weight and volume and economical use the harvested material were investigat 'Initiation pressure,' indicating material condit relative to dewatering ease, permitted predicti of moisture content. With dead-weight, consta pressure dewatering operations, a short effici period was followed by a slower falling-r period; a derived second-order rate mechani describes the falling-rate period. The solids:liq ratio was constant, so juice solids can be pressed as a fraction of original solids can be pressed as a fraction of original solid, as verif by a laboratory screw press. Correlation betwe juice solids and chemical constituents indica need for efficient solid-liquid separation. Weig volume reductions were achieved by concentr ing solids by solid-liquid separation and discard low-solid supernatants. Eurasian watermilfoil terrestrial forage plant chemical composit were comparable and related to plant matur Because of high crude protein, calcium,

anthophyll and low crude fiber contents, water-ilfoil can be used in low-fiber rations, poultry ed supplements, fertilizers, or mulches. Recom-endations suggest that the laboratory screw ess and continuous solid-liquid separation equip-ent be tested further, that animal feeding trials conducted, and indoor growth tanks used to udy frequency and depth of harvesting and asonal effects on aquatic vegetation growth. uchanan-Davidson-Wisconsin).
76-05469

C. Use Of Water Of Impaired Quality

UALITY OF WELL-WATERS OF NORTHERN ADHYA PRADESH,
llege of Agriculture, Parbhani (India).
r primary bibliographic entry see Field 4B.
76-05146

OMMON LAW REMEDIES FOR SALT POL-TION,
r primary bibliographic entry see Field 6E.
76-05191

OLORADO RIVER SALINITY PROBLEM: AS A SOLUTION BEEN FOUND,
nver Univ., Colo. Coll. of Law
r primary bibliographic entry see Field 6E.
76-05200

GRONIMIC EFFECTS OF THE LAND SPOSAL OF WASTES FROM THE AGRICUL-RAL AND FOOD INDUSTRIES EPERCUSSIONS AGRONOMIQUES DES ANDAGES D'EFFLUENTS DES INDUSTRIES RICOLES ET ALTIMENTAIRES,
titut National de la Recherche A Agronomique, rsailles (France). Station Centrale Agronomie.
r primary bibliographic entry see Field 5D.
76-05331

STRIBUTION OF DIFFERENT QUALITIES UNDERGROUND WATERS IN REWARI HSIL OF HARYANA STATE,
ryana Agricultural Univ., Hissar (India).
R. Manchanda, M. L. Manchanda, and R. S. ag.
ian J Agric Sci. 42(9): 835-839, 1972.

scriptors: *Water wells, *Water quality, undwater, Irrigation, *Salinity, Soil treatment, ne water, Salt tolerance, Distribution, Soil ure.
ntifiers: *India(Haryana), Tube-well waters.

m 142 villages of Rewari tehsil of Haryana, 575 l-waters or tube-well-waters were collected. as having normal, saline, sodic and saline-cum-c water pockets were delineated. In Bawal, vari, Pataudi and Khol blocks, 13, 22, 22 and of the underground waters, respectively, e safe for irrigation; but 12-26% of the waters e area were highly saline-cum-sodic, with high ntent, and were unsafe for irrigation. Subsoil ers of Pataudi and Bawal blocks (48 and 75%) e predominantly sodic with low salt content, h could be profitably exploited by treatment gypsum. In this tehsil, 15-32% waters were ly saline, and could be occasionally used on textured soils for salt tolerant crops.--Copy-1974, Biological Abstracts, Inc.
-05432

3D. Conservation In Domestic and Municipal Use

THE ECONOMIC VALUE OF WATER FOR SELECTED USES IN SOUTHWESTERN NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05350

DEVELOPMENT PRIORITIES IN THE WEST RIVER REGION, NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05352

HOUSEHOLD WATER USE,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05353

THE SEWERLESS SOCIETY,
For primary bibliographic entry see Field 5D.
W76-05439

ECONOMICS OF URBAN WATER DEMAND: A CASE STUDY OF THE HONOLULU BOARD OF WATER SUPPLY,
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6D.
W76-05455

3E. Conservation In Industry

RAIN DANCE DOESN'T WORK HERE ANY-MORE, OR WATER USE AND CITIZEN AT-TITUDES TOWARDS WATER USE IN AL-BUQUERQUE, NEW MEXICO,
New Mexico Univ., Albuquerque. Div. of Govern-mental Research.
For primary bibliographic entry see Field 6B.
W76-05016

ELECTROCHEMICAL CONTAMINANT REMOVAL FROM AQUEOUS MEDIA,
Andco Inc., Buffalo, N.Y. (assignee)
For primary bibliographic entry see Field 5D.
W76-05024

PROCESS FOR RECOVERING TIN SALTS FROM THE WASTE RINSE WATER OF A HALOGEN TIN PLATING PROCESS,
Pitt Metals and Chemicals, Inc., Pittsburgh, Pa. (assignee)
For primary bibliographic entry see Field 5D.
W76-05025

BIOLOGICAL TREATMENT OF PLANT WASTE STREAMS TO REMOVE CYANURIC ACID,
FMC Corporation, Philadelphia, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-05027

PREPARATION OF ACTIVATED SLUDGE AND TREATMENT OF WASTE WATER THEREWITH,
Nippon Gohsei Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W76-05028

DEVICE FOR THE CONTINUOUS TREAT-MENT OF LIQUID STREAMS,
Gesellschaft zur Wiederaufarbeitung von Kern-brennstoffen m.b.H., Leopoldshafen bei Karl-sruhe (West Germany).
For primary bibliographic entry see Field 5D.
W76-05033

WATER POWER MACHINE AND UNDERSEA, UNDER WATER GENERATOR STATION,
For primary bibliographic entry see Field 8C.
W76-05039

REFINERY DESIGN (CIRCA 1984),
Fluor Engineers and Constructors, Inc., Los An-geles, Calif.
For primary bibliographic entry see Field 5D.
W76-05104

EFFLUENT CONTROL AND WATER CONSER-VATION AT BOWATER-SCOTT MILL, NORTHFLEET.
For primary bibliographic entry see Field 5D.
W76-05106

POLLUTION CONTROL IN THE SWEDISH PULP AND PAPER INDUSTRY,
Swedish Pollution Control Co., Stockholm.
For primary bibliographic entry see Field 5D.
W76-05108

RECYCLING OF COOLING WATER IN CABLE MANUFACTURE,
Western Electric Co., Buffalo, N.Y.
For primary bibliographic entry see Field 5D.
W76-05120

WATER AS A FACTOR IN ENERGY RESOURCES DEVELOPMENT,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6B.
W76-05250

INDUSTRIAL OILS, RECOVERY OR DISPOSAL. (LES HUILLES INDUSTRIELLES, RECUPERATION OU ELIMINATION.),
For primary bibliographic entry see Field 5D.
W76-05280

EFFLUENT CONTROL IN ZINC BONDERIZ-ING PROCESSES: I. THE RECYCLE OF RINSE WATERS VIA AN ION EXCHANGE PROCESS,
Puricons, Inc., Berwyn, Pa.
For primary bibliographic entry see Field 5D.
W76-05284

PROBLEMS OF GALVANIC WASTEWATER PURIFICATION IN CLOSED WATER CYCLE (PROBLEMY OCZYSZCANIA SCIEKOW GAL-WANIZERSKICH W ZAMKNIETYM OBIEGU WODNYM),
For primary bibliographic entry see Field 5D.
W76-05285

DECOLORIZE KRAFT BLEACH PLANT EF-FLUENTS EFFECTIVELY WITH LOW-COST POLYMERIC ADSORPTION METHOD,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W76-05288

ADSORPTION TREATMENT OF KRAFT PULP LIGNIN WASTE WITH SYNTHETIC, POLYMERIC ADSORBENTS, (IN JAPANESE),
National Research Inst. for Pollution and Research, Tokyo (Japan).
For primary bibliographic entry see Field 5D.

W76-05289

CLOSED SYSTEM FOR WASTE WATER IN METAL SURFACE PROCESSING FACTORY, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W76-05290

WATER QUALITY AND THE TEXTILE INDUSTRY,
Cosgrove (W. J.) and Associates, Inc., Montreal (Quebec).
For primary bibliographic entry see Field 5D.
W76-05292

WOOL SCOUR WASTE TREATMENT.
For primary bibliographic entry see Field 5D.
W76-05293

REVERSE OSMOSIS IN INDUSTRIAL WATER TREATMENT,
Permutit Co., London (England).
For primary bibliographic entry see Field 5D.
W76-05296

WASTEWATER TREATMENT SYSTEM IN STEEL MILLS, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W76-05311

PURIFIER ESP. FOR ELECTRO PLATING EFFLUENT WATER.
For primary bibliographic entry see Field 5D.
W76-05313

MUNICIPAL WASTEWATER RECLAMATION--AN INDUSTRIAL WATER SUPPLY,
Dallas Reclamation Research Center, Tex.
For primary bibliographic entry see Field 5D.
W76-05318

OZONIZATION AS A MEANS OF WASTE WATER PURIFICATION,
For primary bibliographic entry see Field 5D.
W76-05339

THE ECONOMIC VALUE OF WATER FOR SELECTED USES IN SOUTHWESTERN NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05350

DEVELOPMENT PRIORITIES IN THE WEST RIVER REGION, NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05352

GUIDE TO THE COSTING OF WATER FROM NUCLEAR DESALINATION PLANTS,
Applied Research and Engineering Ltd., Durham (England).
For primary bibliographic entry see Field 3A.
W76-05436

WATER TREATMENT--TECHNIQUE FOR ENERGY CONSERVATION,
Betz Entec, Inc., Trevose, Pa.
For primary bibliographic entry see Field 5F.
W76-05438

IDENTIFICATION OF GAMMA-VALEROLACTONE IN WASTE WATER FROM AN OIL-SHALE IN SITU RETORT,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
For primary bibliographic entry see Field 5A.
W76-05448

WATER USE IN SELECTED COMMERCIAL AND INSTITUTIONAL ESTABLISHMENTS IN THE BALTIMORE METROPOLITAN AREA,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05452

REUTILIZATION EXPERIMENTS ON WASTE WATER FROM PAPER AND PULP MILLS (KAMI PARUPU KOJO HISUI NO SAISEI RYO JIKKEN),
For primary bibliographic entry see Field 5D.
W76-05482

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (FIRST PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 5D.
W76-05483

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (SECOND PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services.
For primary bibliographic entry see Field 5D.
W76-05484

SYSTEM ANALYSIS OF REFINER MILL OPERATION,
Idaho Univ., Moscow. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W76-05487

BIG SAVINGS WITH REVERSE OSMOSIS AND ACID COPPER,
For primary bibliographic entry see Field 5D.
W76-05493

NEW MEMBRANES FOR TREATMENT OF METAL FINISHING EFFLUENTS BY REVERSE OSMOSIS.
For primary bibliographic entry see Field 5D.
W76-05495

LOOP CLOSED ON CADMIUM.
For primary bibliographic entry see Field 5D.
W76-05497

EFFICIENT, NONPOLLUTING ETHYLBENZENE PROCESS,
Mobil Research and Development Corp., Paulsboro, N. J.
For primary bibliographic entry see Field 5D.
W76-05498

SOLVENT RECOVERY FROM POLYMER PRODN. WASTES.
For primary bibliographic entry see Field 5D.
W76-05499

3F. Conservation In Agriculture

BIBLIOGRAPHY OF WATER RESOURCES OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 10C.
W76-05013

A CONTINUOUS REVIEW INVENTORY MODEL FOR IRRIGATION WATER APPLICATION,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
M. A. Cali.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-25 118, $5.00 in paper copy, $2.25 in microfiche. Master of Science Thesis, 1975, 85 p, 3 fig, 2 tab 36 ref, 3 append. OWRT B-032-ARIZ(10).

Descriptors: *Irrigation systems, *Irrigation efficiency, *Water management(Applied), *Soil water-plant relationships, *Costs, Irrigation operation and maintenance, Irrigation practices, Irrigation programs, Management, Water delivery, Water requirements, Agriculture, Irrigation, Irrigation water, Water distribution(Applied), Rate of application, Timing, Crop response, Rainfall, Evapotranspiration, Soil moisture.

Efficient management of farm irrigation systems involves the proper choice of method, timing, and quantity of irrigation water application. Through the use of a continuous review model of the irrigation system, an optimal irrigation policy may be obtained and effected. Implementation of the model requires knowledge of the crop susceptibility to moisture stress, the crop's expected demand for water, and the expected precipitation. Using this knowledge, an optimal amount of irrigation and an optimal reorder point may be determined and with continuous monitoring of the level of available soil moisture, the farmer irrigates the optimal amount when the reorder point is reached. A review is given of several existing methods for maximizing crop yield or profit by determining an optimal irrigation policy. An analogy is drawn between the farmer's problem of determining an optimal irrigation policy and the businessman's problem of determining an optimal ordering policy. (Robinett-Arizona)
W76-05019

METHOD FOR IRRIGATING TERRAIN,
W. C. Reeder, and N. D. Batterson.
U.S. Patent No. 3,926,374, 5 p, 14 fig, 3 ref; Official Gazette of the United States Patent Office Vol 941, No 3, p 1204, December 16, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, Sprinkler irrigation, Water distribution(Applied), Irrigation efficiency, Irrigation effects, Flow control, Application equipment, Temperature control, Frost protection.
Identifiers: *Drip irrigation, *Weeper irrigation

A weeper type irrigation system is disclosed which has a variety of modes of use including wide varying flow rates and different modes of discharging water not only for irrigation purposes but to control humidity and temperature conditions. Both the water distributing manifold and weeper device are formed from semi-rigid or rigid plastic material. The weeper device comprises an inlet tube having self-sealing self-retaining fit with a mounting hole punched through the side of the plastic distributing manifold. A ball type of valve is held captive within the tubular housing and responsive to gravity to seat against a valve seat near its inlet end and responsive to flowing pressurized water to seat against an outer weeper valve seat. At least one and preferably a number of minute flow passages are formed in the latter seat and converge toward the outlet opening in a manner effective to create a misty spray of the small flow permitted so long as the water pressure holds the valve seated across the weeper or outlet seat. If not obstructed, the resulting misty spray may extend to a height of several feet before falling to the ground in a widely dispersed manner. A protective guard cap having a snap fit over

utlet end is effective when in one installed posi-
ion to invert this spray discharge to a flow occur-
ing along the exterior side of the weeper and
hence into the ground. If the cap is pressed to a
econd position, it holds the valve off the valve
eat and allows a substantially greater flow for in-
reased irrigation. (Sinha - OEIS)
V76-05021

VEEPER IRRIGATION DEVICE,
V. C. Reeder, and N. D. Batterson.
J.S. Patent No. 3,926,375, 4 p, 4 fig, 3 ref; Official
Gazette of the United States Patent Office, Vol
41, No 3, p 1204, December 16, 1975.

escriptors: *Patents, *Irrigation, *Irrigation
ystems, *Water distribution(Applied), *Irrigation
fficiency, Irrigation effects, Flow control,
alves, Application equipment.
lentifiers: *Weeper irrigation, *Drip irrigation.

weeper irrigation device is improved by utilizing
additional flow responsive valve member in the
alve chamber. This second valve member
mains in the close vicinity of the inlet valve seat
hereas the other valve member responds to the
essure build-up in the valve chamber on initia-
n of water flow and moves into seating engage-
ent with the weeper outlet valve seat. Any ten-
ncy of the inlet valve to spin or gyrate is con-
ed to this valve member with the result that the
her valve member responds quickly to pressure
ildup to seat against the weeper outlet and
mains firmly seated there until the water supply
cut off. During the brief interval the weeper flow
ntrol valve is rising to its operating position a
shing flow of water takes place and this flow is
ghly effective in removing any sediment which
y have collected along the outlet passage. The
eeper also includes a short tubular outlet passage
er which either a short or a long extension hose
n be readily telescoped with a snug fit. A short
be permits the weeper device to be buried
ghtly below the ground surface with only the
scharge end of the tube exposed. (Sinha-OEIS)
76-05022

EAT PLAINS EVAPOTRANSPIRATION BY RESISTANCE MODEL USING REMOTELY NSED THERMAL IMAGERY,
braska Univ. Lincoln. Dept. of Agricultural En-
eering.
r primary bibliographic entry see Field 2D.
76-05179

PERIMENTAL DETERMINATION OF SOIL OISTURE ON IRRIGATED LANDS FROM DIOACTIVE SOIL EMISSION,
primary bibliographic entry see Field 2G.
6-05401

WATER QUANTITY MANAGEMENT AND CONTROL

. Control Of Water On The Surface

LIOGRAPHY OF WATER RESOURCES OF E HAWAIIAN ISLANDS,
vaii Univ., Honolulu. Water Resources
earch Center.
primary bibliographic entry see Field 10C.
-05013

CONTINUOUS REVIEW INVENTORY DEL FOR IRRIGATION WATER APPLICA-N,
ona Univ., Tucson. Dept. of Systems and In-
rial Engineering.
primary bibliographic entry see Field 3F.

W76-05019

AN ENGINEERING EMERGENCY: THE 1974 FLOODS,
Brisbane City Council (Australia). Dept. of Water Supply and Sewerage.
G. Cossins.
The Journal of the Institution of Engineers, Australia, Vol. 47, No. 7-8, p 20-23, July-August, 1975. 1 fig, 4 ref.

Descriptors: *Floods, Flood control, Flood damage, Flood forecasting, Warning systems, Flood flow, Flood peak, *Australia, Public utilities, Repairing.
Identifiers: *Brisbane(Australia).

The effects of the 1974 floods on the Brisbane area of Australia are discussed. While hydrologists were busy forecasting levels, directing the operations of the flood mitigation dams and directing the measurement of flood flows, operation and maintenance engineers were occupied in securing the safety of municipal and public services. The flooding exceeded 20 meters in some areas and it lasted from a few hours in some areas to a few weeks in others. When the flooding reached its peak, activities changed from rescue to repair and rehabilitation of public facilities damaged by the flood. The objectives were to restore as rapidly as possible services of water supply, electricity, sewerage, communications and transportation. New structures were designed to replace those that had been destroyed by the flood. Funds to restore public facilities were readily available, but the private sector found it very difficult going and so work proceeded very slowly. The major lesson learned from the flooding was the need to bridge the communications gap between forecasters and public. One of the provisions built into the new flood warning scheme is the involvement of up to 300 personnel on a voluntary basis in the event of future floods. There are still two deficiencies to be worked out. The public should have access to flood records and maps as a matter of right and there is a need for a systematic study of the attitude of the public toward all aspects of flooding. (Pinto-FIRL)
W76-05059

THE APPLICATION OF A SPILLWAY FOR RIVER FLOOD CONTROL,
Thames Water Authority. London (England).
C. Van Beeston.
Water Services, Vol. 79, No. 956, p 414-418, October, 1975. 5 fig, 14 ref.

Descriptors: *Flood control, *Spillways, *River regulation, Floodgates, Control structures, Siphon, Navigation, Channels, Flood flow, Model studies.
Identifiers: Lee Valley(Eng), England, Hydraulic model study.

The application of siphon spillways to river flood control in the Lee Valley, England, is discussed. The main control structures at present comprise gates of several types. The need for control of water levels within narrow limits between low and flood flows led to the concept of an air-regulated siphon type of control. The river system consists of river and navigation channels which are in some places combined. Certain minimum depths of water are required for shipping interests. Floods have occurred in this valley several times. The one in 1947 set the design for the present river system. Recent flooding in 1968 has prompted contracts for new improvements. These contracts provide improvement at the downstream end of the river in order to provide for the additional flow capacity created by new upstream works. The operation of the gates have undergone some problems during flood conditions when the required openings are not attained, due either to moving elements or motive forces or a combination of the two. Siphons, after originally being considered dangerous, were reevaluated and were found to be acceptable if floating debris were effectively excluded from the entrance and if additional discharge capability were provided. The siphon would be of the air-regulated type to avoid violent surging. An hydraulic model study of the siphon structure was conducted in the laboratory. This model study showed that the siphon was able to discharge large debris and had acceptable discharge characteristics. (Pinto-FIRL)
W76-05098

MATHEMATICAL MODELS PREDICT CONCENTRATION-TIME PROFILES RESULTING FROM CHEMICAL SPILL IN A RIVER,
Dow Chemical U. S. A., Midland, Mich. Health and Environmental Research.
For primary bibliographic entry see Field 5B.
W76-05155

AN EFFICIENT TRANSITION DEFINITION FOR DISCRETE STATE RESERVOIR ANALYSIS: THE DIVIDED INTERVAL TECHNIQUE,
New South Wales Univ., Kensington (Australia). School of Civil Engineering; and New South Wales Univ., Kensington (Australia). Dept. of Water Engineering.
D. G. Doran.
Water Resources Research, Vol. 11, No. 6, p 867-873, December 1975. 11 fig, 10 ref.

Descriptors: *Synthetic hydrology, *Simulation analysis, *Model studies, *Stochastic processes, *Reservoirs, Reservoir operation, Reservoir yield, Reservoir storage, Inflow, Computer models, Probability.
Identifiers: *Divided interval technique, *Discretization schemes, Probability of emptiness.

Discrete state-discrete time stochastic matrix methods of reservoir analysis may be used to estimate the relationships between reservoir capacity, yield, and probability of emptiness for given inflow distributions. To avoid excessive computation and computer storage demands, these methods most commonly use methods most commonly use models in which the state variable is discretized into a small number of finite states. This, however, generally leads to inaccurate solutions. To improve computational efficiency and allow solutions with reasonable accuracy with small numbers of finite states, a method was proposed of modeling the storage process which has been called 'the divided interval technique'. This method was described, and its results compared, by means of examples, with those from the existing method. (Bender-ISWS)
W76-05161

CAPABILITY OF INTEGER PROGRAMMING ALGORITHMS IN SOLVING WATER RESOURCE PLANNING PROBLEMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6A.
W76-05183

FLOOD DAMAGE.
For primary bibliographic entry see Field 6E.
W76-05206

PERSPECTIVES ON THE ARMY ENGINEERS WATER MANAGEMENT MISSION,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-05211

NEBRASKA FLOOD PLAIN REGULATIONS ACT.
For primary bibliographic entry see Field 6F.
W76-05224

REGULATION OF CONSTRUCTION WITHIN FLOOD PLAINS ESTABLISHED PURSUANT OF SECTION 65F, CHAPTER 19, ILLINOIS REVISED STATUTES.
For primary bibliographic entry see Field 6F.
W76-05225

CHANGES IN 1972 COLUMBUS CITY CODE (FLOOD HAZARD ORDINANCE.)
For primary bibliographic entry see Field 6F.
W76-05226

MODEL FLOOD PLAIN ZONING ORDINANCE (OHIO),
Mid-Ohio Regional Planning Commission, Columbus.
For primary bibliographic entry see Field 6F.
W76-05227

A THREE-DIRECTIONAL APPROACH TO FLOOD PLAIN MANAGEMENT, MINNESOTA EXPERIENCES,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6F.
W76-05228

ORDINANCE AMENDING SECTION 7-1 AND 7-2 OF ARTICLE 1 OF THE COLLIER COUNTY BUILDING CODE (FLOOD PLAIN AND COASTAL CONSTRUCTION).
For primary bibliographic entry see Field 6F.
W76-05230

AN ORDINANCE RELATING TO DRAINAGE AND FLOOD CONTROL.
For primary bibliographic entry see Field 6E.
W76-05234

FLOOD CONTROL AND FLOOD WATER CONSERVATION.
For primary bibliographic entry see Field 6E.
W76-05235

AN ORDINANCE AMENDING THE GREENSBORO CODE OF ORDINANCES WITH RESPECT TO ZONING.
For primary bibliographic entry see Field 6F.
W76-05236

LAND USE MEASURES TO HELP PREVENT FLOOD HAZARDS AND LOSSES IN FLOOD PLAIN AREAS.
For primary bibliographic entry see Field 6F.
W76-05237

AMENDMENTS TO BUILDING CODE TO PREVENT FLOOD HAZARDS AND LOSSES.
For primary bibliographic entry see Field 6F.
W76-05238

PROPOSED FLOODPLAIN REGULATIONS FOR THE GREATER ANCHORAGE AREA BOROUGH.
Greater Anchorage Area Borough, Alaska. Planning Dept.
For primary bibliographic entry see Field 6F.
W76-05239

PROPOSED PENNSYLVANIA FLOOD DISASTER PREVENTION ACT.
For primary bibliographic entry see Field 6F.
W76-05241

SAMPLE ZONING REGULATIONS FOR THE MANAGEMENT OF FLOOD HAZARD AREAS.
For primary bibliographic entry see Field 6F.
W76-05242

RURAL RESIDENTIAL WATER DEMAND IN KENTUCKY: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6D.
W76-05252

HYDRAULIC DESIGN CRITERIA FOR INLAND WATERWAYS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-05254

FLOOD PLAIN INFORMATION: FARMINGTON AND CONNECTICUT RIVERS, WINDSOR, CONNECTICUT.
Army Engineer District, Waltham, Mass.
Prepared for the Town of Windsor, March 1971. 44 p, 10 fig, 8 plates, 7 tab.

Descriptors: *Floods, *River forecasting, *Flood forecasting, *Flood profiles, *Flood plains, Floodwater, Flooding, Hurricanes, Historic floods, Flood data, Flood frequency, Ice jams, Obstructions to flow, Snowmelt, Backwater, Non-structural alternatives, Flood plain zoning, Zoning, Dams, *Connecticut, *Connecticut River.
Identifiers: Windsor(CT)Farminton River(CT), *Connecticut River(CT), Rainbow Dam(CT), Standard Project Flood, Intermediate Regional Flood.

Windsor, about 5 miles north of Hartford, is situated at the confluence of the Farmington and Connecticut Rivers. Little development has taken place in the flood plain because of past flooding. Most land is devoted to agriculture, chiefly growing tobacco, and recreation. Development in the southern part of town has been built in the flood plain but most residential development is on higher ground. The Connecticut River drains 11,250 sq mi at its mouth including 609 sq mi which are drained by the tributary Farmington River. Since 1639 the Connecticut River has overflowed about 220 times at Windsor; 145 of these occurred due to excessive spring runoff from melting snow and warm rain in March through May. Flooding has occurred in all months of the year and two tropical hurricanes caused the 2nd and 3rd highest floods. The highest flood on the Connecticut River in 1936 crested about 34 ft higher than normal flow. Great icejams formed upstream and when these broke flood waters rose to unprecedented heights. On the Farmington River the greatest flood occurred in 1955 with a peak discharge of 69,200 cfs. The 1936 flood had a peak discharge of 26,550 cfs on this river. In an Intermediate Regional Flood a peak discharge of 176,000 cfs at the confluence of the rivers is expected with an elevation about 8 ft lower than the 1936 flood. In a Standard Project Flood (SPF) on the Connecticut River the discharge would reach 313,000 cfs, equivalent to the 1936 flood. Above Rainbow Dam on Farmington River elevation during an SPF would be 2 ft higher than the 1936 flood. Sixteen flood control dams on the Farmington River reduce the effects of floods; only Rainbow Dam is within this study area. (Smith-North Carolina)
W76-05256

FLOOD PLAIN INFORMATION: WEST BRANCH DUPAGE RIVER, KRESS CREEK, AND KLEIN CREEK, DUPAGE COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
Prepared for the County of Dupage, Illinois, June, 1975. 42 p 18 fig, 28 plates, 7 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, Floodwater, *Flooding, Streamflow forecasting, Historic floods, *Peak discharge, Flood damage, Obstructions to flow, Snowmelt, Thunderstorms, *Non-structural alternatives, *Zoning, Dams, *Illinois.
Identifiers: Standard Project Flood, Intermediate Regional Flood, Dlupage River, West Branch(Il), Kress Creek(Il), Klein Creek(Il), Warrenville(IL), Dupage County(Il), Napervile(Il), Fawell Dam(Il), Bench marks.

Dupage County, a residential and light industrial area west of Chicago, has grown rapidly over the past 35 years. Population increases are expected to continue. Lands in the flood plains of the streams of this study are agricultural, light and dense residential, commercial and light industrial. The West Branch of the Dupage River has a drainage area of 123 sq mi. Its tributaries, the Klein and Kress Creeks, drain 14.7 and 16.5 sq mi respectively. Floods have usually resulted from heavy thunderstorms after prolonged rainfall and can occur in any season. There are 5 stream gages within this area, one in operation since 1940. Floods have occurred 16 times since 1942. The most damaging was in 1972 when many residential and commercial areas were flooded and damage was $8 million. The peak discharge on the West Branch was 5200 cfs. During an Intermediate Regional Flood a peak discharge of 5600 cfs on the West Branch, 1170 cfs on Kress Creek, and 1150 on Klein Creek are predicted. Water velocities on the West Branch will be 1.5 to 7.3 ft/sec above Fawell Dam and 2.5 to 5.5 ft/sec below the dam. This flood would rise to its peak in 19.5 hours and remain above flood stage for 105 hours. During a Standard Project Flood peak discharges of 14,140 cfs, 2670 cfs and 2610 cfs are expected on the West Branch, Kress and Klein Creeks respectively. This flood would reach its peak in 45 hours and last 372 hours. Either flood would cause substantial damage. Fawell Dam provides some flood protection, but 2 low-flow dams have no storage capacity. Dupage County has a zoning ordinance which regulates flood plains and Naperville has a flood ordinance which requires storage of storm water runoff to reduce flood damage. (Smith-North Carolina)
W76-05257

SPECIAL FLOOD HAZARD INFORMATION DUNN BRANCH, WOODBINE, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for the City of Woodbine, Georgia February 1973. 5 p 13 plates.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flood proofing, *Non-structural alternatives, Hurricanes, Tides, Channels, *Georgia, Management.
Identifiers: Woodbine(Ga), Dunn Branch(Ga), *Flood plain kmanagement, Rattlesnake Creek(Ga), Stailla River(Ga), Camden County(Ga), Intermediate Regional Flood.

Dunn Branch flows in a northeasterly direction through the town of Woodbine (1970 population 1000) in Camden County, Georgia. A tributary of the Satilla River, Dunn Branch, which is affected by normal tidal fluctuations, is joined by Rattlesnake Creek east of Woodbine; these streams have a combined drainage area of 3.3 miles. Rattlesnake Creek is an improved channel now full of vegetation. Dunn Branch is relatively straight with tidal mRattlesnake Creek is an improved channel now full of vegetation. Dunn Branch is relatively straight with tidal marsh overbanks downstream of North Brewster Avenue. Stream overflow occurs fairly often causing damage to public and private property, disrupting traffic and creating a health hazard as septic tanks fail to function properly. The study area is subject to both general rainfall flooding and hurricane tidal flooding. Although the incidence of hurricanes affecting the Woodbine area has been low in the past, damages are usually heavy from tidal flooding owing to the corrosive properties of sea water and additional damage caused by high winds. Flood heights during the Intermediate Regional Flood can reach 13 feet above mean sea level on Dunn Creek near U. S. Highway 17. Suggested measures for flood plain management include flood proofing and regulations for guiding and controlling developments in flood hazard areas. (Henley-North Carolina)

05258

IAL FLOOD HAZARD INFORMATION: ANSAS RIVER AND WILD HORSE K, HOLLY, COLORADO.
Engineer District, Albuquerque, N. Mex.
1975. 32 p, 4 fig, 6 plates, 4 tab.

iptors: *Floods, *Flood plains, *Flood pro-n, *Flood damage, *Flood profiles, *Non-ural alternatives, *Flood forecasting, Flash Historic floods, Flood data, Peak discharge, Beds, Warning systems, Control structures, s, Dam, *Colorado.
fiers: Holly(CO), *Arkansas River(CO), Horse Creek(CO), Two Butte Creek(CO), l plain management, John Martin Reser-O), Standard Project Flood, Intermediate n Flood, Flood proofing.

utte Creek and Wild Horse Creek enter the sas River in the vicinity of Holly, a trading for livestock and farming industry with a tion of 993 in 1970, and have a drainage area d 210 sq mi respectively. The contributing of the Arkansas River between the John Reservoir and Holly has a drainage area of sq mi and is characterized by a wide bed, low banks, and a slope of 6 ft/mi near Five damaging floods have occurred since he worst occurring in June 1965 when the sas River and Two Butte Creek had peak ges of 200,000 and 182,000 cubic ft/sec tively. Holly was inundated by as much as 8 water and damages were estimated at 000. The Intermediate Regional Flood and andard Project Flood would have peak ges of 82,000 and 160,000 cfs respectively. control measures in the area include the Iartin Dam on the Arkansas River near Las which is capable of detaining SPF flood Levees which route the creek west of town Holly from flood flows of Wild Horse Discussed guidelines for flood plain ement include floodway designation, zon-ubdivision regulations, building codes, oment policies, flood proofing, health regu-flood forecasting and evacuation, open urban development, warning signs, tax ad-nts, and flood insurance. (Henley - North a)
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NING MODEL FOR CONJUNCTIVE-USE R SYSTEMS,
Engineering Co., Chicago, Ill.
amdan, and D. D. Meredith.
of the Hydraulics Division, American of Civil Engineers, Vol. 101, No. HY10, ings paper No. 11611, p 1343-1355, Oc-75. 2 fig, 4 tab, 16 ref. OWRT(1-7229(No.

tors: *River basin development, ative planning, *Conjunctive use, ing, *Water supply, *Reservoir operation, cs, Groundwater, Surface waters, Op-n, Investment, Constraints, Water policy, Vaater management (Applied), Water de-quifers, Equations, Computers, Pipelines, atical models, Systems analysis, Water al-Policy), Illinois.
rs: Kaskaskia River basin(Ill), Cost ation, Shadow prices, Out-of-Kilter al-

d is a preliminary screening model for the conjunctive use of ground and sur-er in a river basin. The model is a cost ation flow network model, which uses the lter algorithm as a solution technique. It is identify potentially optimal alternative ermitting determination of size of struc-l scheduling (design and operating rules). ernative system can meet basin demands, least-cost plan to meet demands is identified. The out-of-kilter algorithm is used to determine the minimal cost flow through the network. Computer output provides the minimal cost allocation schedule over the planning period and the shadow prices of supplies and demands. An example problem in the Kaskaskia River basin demonstrates how the network analysis procedures can be used to determine optimum investment plans, test policy constraints, and develop policies for future development and constraints. Three alternatives (conditions of supply availability) are considered: (1) imported water, local groundwater, and existing surface reservoirs; (2) local groundwater and existing and potential surface reservoirs, but no importation; and (3) imported water, local groundwater, and existing and potential surface water reservoirs. Study results define the initial alternatives for a detailed simulation study to refine the size and operating policies of the system components. (Bell-Cornell)
W76-05268

BAYESIAN GENERATION OF SYNTHETIC STREAMFLOWS.
Resource Analysis, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 2A.
W76-05271

A BAYESIAN APPROACH TO ANALYZING UNCERTAINTY AMONG FLOOD FREQUENCY MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2E.
W76-05272

RESISTANCE TO FLOW IN A COMBINED CHANNEL,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W76-05273

SOCIAL IMPACTS AND METHODOLOGICAL PERSPECTIVES FROM A POST AUDIT ANALYSIS OF WATER RESOURCE DEVELOPMENT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W76-05360

FLOOD PROFILES AND INUNDATED AREAS ALONG THE DESCHUTES RIVER, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W76-05415

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS--OKLAHOMA,
Geological Survey, Little Rock, Ark.
T. E. Lamb.
Open-file report, 1975. 26 p, 1 fig, 3 tab, 3 ref.

Descriptors: *Basic data collections, *Streamflow, *Water yield, *River basins, *Arkansas, *Oklahoma, Gaging stations, Flow measurement, Average flow, Peak discharge, Low flow, Runoff, Interstate compacts.
Identifiers: *Arkansas River Basin Compact(Ark-Okla), Arkansas River.

The computed annual yield of subbasins in the Arkansas River basin as defined in the Arkansas River Basin Compact, Arkansas-Oklahoma, 1972, are presented. For this report, the Arkansas River basin means all of the drainage basin of the Arkansas River and its tributaries from a point immediately below the confluence of the Grand-Neosho River with the Arkansas River near Muskogee, Oklahoma, to a point immediately below the confluence of Lee Creek with the Arkansas River near Van Buren, Arkansas, together with the drainage basin of Spavinaw Creek in Arkansas, but excluding that portion of the drainage basin of the Canadian River above Lake Eufaula Dam. (Woodard-USGS)
W76-05416

A METHOD FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MONTANA,
Geological Survey, Helena, Mont.
M. V. Johnson, and R. J. Omang.
Open-file report 75-650, January 1976. 35 p 6 fig, 3 plates, 1 tab, 14 ref, append.

Descriptors: *Flood forecasting, *Flood frequency, *Flood peak, *Methodology, *Montana, Equations, Mathematical studies, Flood recurrence interval, Natural flow, Drainage area, Channel morphology, Watersheds(Basins), Gaging stations, Streamflow, *Estimating.
Identifiers: *Log-Pearson Type III analysis, Ungaged sites.

Methods are provided for estimating flood characteristics at most natural flow sites on rural streams in Montana. Flood data and related information for many gaged sites on Montana streams also are presented. Frequency curves are included for 442 gaged sites as defined by log-Pearson Type III analysis. To allow estimates at ungaged sites, mathematical equations relate the 2-, 5-, 10-, 25, 50-, and 100-year flood magnitudes to basin characteristics. Drainage area, main channel slope, and mean annual precipitation were the most significant estimating variables. Equations presented are limited to use on streams with drainage areas from about 0.1 to 2,600 sq mi, with slope from about 5 to 1,200 ft/mi, and with precipitation from 10 to 100 in. Nomographs provide a simple graphical means of solving the estimating relations, and illustrative examples are presented. (Woodard-USGS)
W76-05422

ANNUAL MAXIMUM STAGES AND DISCHARGES OF NORTH CAROLINA STREAMS,
Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 7C.
W76-05423

GEOHYDROLOGIC RECONNAISSANCE AND MEASUREMENT OF PERENNIAL STREAMS CROSSING OUTCROPS OF THE MADISON LIMESTONE, NORTHEASTERN WYOMING, 1974,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2E.
W76-05425

TIME-OF-TRAVEL OF SOLUTES IN THE TRINITY RIVER BASIN, TEXAS, SEPTEMBER 1973 AND JULY-AUGUST 1974,
Geological Survey, Fort Worth, Tex.
For primary bibliographic entry see Field 7C.
W76-05426

WATER RESOURCES OF BASINS FOR MINOR STREAMS DRAINING INTO ST. CLAIR RIVER, LAKE ST. CLAIR, DETROIT RIVER, AND LAKE ERIE, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-05427

HYDROLOGIC UNIT MAP--1974, CARIBBEAN REGION.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-05430

REMOTE SENSING,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7B.
W76-05431

AN INTERNATIONAL CENTRE FOR MANATEE RESEARCH.
National Academy of Sciences, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 244, $3.75 in paper copy, $2.25 in microfiche. Report of a workshop held February 7-13, 1974 at Georgetown, Guyana, 1974. 38 p, 13 fig., 1 tab., 17 ref. AID/csd-2584.

Descriptors: *Biocontrol, *Mammals, *Aquatic weed control, Tropical regions, Aquatic animals, Herbivores, Ecological distribution, Life cycles, Diets, Conservation, Research and development.
Identifiers: *Manatees, Guyana.

Manatees show great potential for controlling aquatic weed infestations in tropical waters. They are native to more than 40 tropical countries in the Americas and Africa and are the world's only herbivorous, totally aquatic mammal. They have been used successfully in Guyana to clear weeds from canals. Their use could enhance drainage, irrigation, hydroelectric schemes, transportation, fishing, and with proper husbandry, can be a palatable protein source for human consumption. 85% of the carcass can be used in addition to the meat. However, manatees are almost extinct. Man is their only predator. Once a colony is established in weed infested areas there are no maintenance costs. An international center for manatee research at Guyana is proposed to sponsor, promote, and coordinate activities on basic research, manatee effectiveness as aquatic weed control agents in tropical regions, to develop programs for repopulating depleted habitats, to promote conservation, to foster their domestication, and to provide guidance in planning and techniques of advanced mammalian research. An interim steering committee was appointed to organize the research center's establishment. (Buchanan-Davidson--Wisconsin)
W76-05433

USER PREFERENCES OF POLICY ALTERNATIVES: THE CASE OF RECREATIONAL USER ATTITUDES TOWARD DEVELOPMENT AND REGULATION AT LAKE MONROE, INDIANA,
Indiana Univ., Bloomington. Poplars Research and Conference Center.
For primary bibliographic entry see Field 6B.
W76-05435

AN ANALYSIS OF WATER RESOURCE BENEFIT DETERMINATION METHODS WITH SPECIAL REFERENCE TO THE COSUMNES RIVER DIVISION PROJECT,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-05441

FLOOD PROOFING DECISIONS UNDER UNCERTAINTY,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6F.
W76-05456

CONTROL OF AQUATIC VEGETATION IN NEW YORK STATE,
New York State Coll. of Agriculture and Life Sciences.
For primary bibliographic entry see Field 5C.
W76-05467

MECHANICAL MANAGEMENT OF AQUATIC VEGETATION: ANALYTICAL STUDIES OF UNIT OPERATIONS POTENTIALLY USEFUL IN THEIR PROCESSING,
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 3B.
W76-05469

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
I. Z. Ballo, and I. Orloczi
Working Paper No. 16, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 27 p, 5 fig, 5 tab, 12 ref. (United Nations, Department of Economic and Social Affairs)

Descriptors: *Water resources development, *River basins, *Land use, *Water management(Applied), *Water supply, *Planning, Economics, Social aspects, Surface waters, Human population, History, Floods, Irrigation, Water pollution control, Water demand.
Identifiers: *Tisza River basin(Hungary), *Developing economies, Impact, Socioeconomic growth, Catchments, International cooperation.

A brief review is presented of the fundamental water management conditions related to land use in the Tisza River Basin, an area of great economic importance to Hungary. The time horizon surveyed comprises two centuries: from 1800 to 2000. The past, present and future socio-economic significance of the Hungarian part of the Tisza Valley is emphasized. The main stages, characteristics, problems, and results of the past 150 years' long history of increasingly complex water management are surveyed. Taking into consideration the projections for the Hungarian part of the basin presently available and the development predicted for the neighboring countries in the catchment, an attempt is made at estimating the needs likely to be raised by the growing population and the developing economic life in the region. The technico-economic and political measures outlined broadly are potential solutions to the problems formulated. Reference is made to the co-operation of the five CMEA neighboring countries and the work started is expected to provide novel experiences for the integrated development of other international river basins of the World in the near future. (Bell-Cornell)
W76-05519

4B. Groundwater Management

BIBLIOGRAPHY OF WATER RESOURCES OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 10C.
W76-05013

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
For primary bibliographic entry see Field 5F.
W76-05042

A SUPPLEMENTAL SOCIO-ENVIRONMENTAL DECISION TOOL: VALUE CONFLICTS ON LONG ISLAND,
Weston (Roy F.) Inc., Roslyn, N.Y.
For primary bibliographic entry see Field 5D.
W76-05049

CORROSION IN DISPOSAL WELLS,
Subsurface Disposal Corp., Houston, Tex.
For primary bibliographic entry see Field 5E.
W76-05125

THE DETECTION AND MAPPING OF SUBTERRANEAN WATER BEARING CHANNELS, PHASE II,
Missouri Univ., Rolla. Dept. of Geophysics.
R. D. Rechtien, L. W. Gardner, M. Sanders, and R. Tucker.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-459, $4.50 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 46 p, 30 fig, 18 OWRT B-087-MO(1). 14-31-0001-3909.

Descriptors: *Subsurface mapping, Subsurface investigations, *Caves, Seismic waves, Resonance, *Seismic studies, Seismographs, Mud, Exploration.
Identifiers: *Cavity resonance phenomena, *Subterranean cavities, *Mud-filled caverns.

Field experiments were conducted over a n surface cavern to obtain a spatial definition of associated Cavity Resonance Phenomenon. T was no indication that resonance phenomenon an air-filled void was measurable. A more accu data system, consisting of a mobile laboratory housing a minicomputer its peripherals and sociated test equipment, was assembled to re three-component ground velocity measurem Traverse lines were selected across two kn carbonate rock cave systems with seismom stations at 10 foot intervals along the line. A accurate subsurface survey was made of passage approximately 162 feet with a uni shape below the surface, a height of about 100 are a width of 51 feet. Reflections of caverns evident, but not strong. Strong reflection wa tained from an unexplored arm of one cave. drilling showed this to be a mud-filled ca Later investigations showed the reverberant motion to be due to mud walls of the subterra cavities. The method developed can show presence of subterranean cavities and prob determine if they are filled or void. (See also 06034)
W76-05129

PUBLIC GROUNDWATER SUPPLIES CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller.
Available from the National Technical Infor tion Service, Springfield, Va. 22161 as PB-25 $4.50 in paper copy, $2.25 in microfiche. Bu 60-15, 1975. 55 p, 2 fig.

Descriptors: *Water supply, *Ill *Groundwater resources, *Well data, U solidated aquifers, Gravels, Sand aqu Groundwater, Groundwater availability, Hy gy, Hydrogeology, Water resources, Water ty, Water wells, Municipal water, Water Water properties, Hardness(Water), Che properties, Shallow wells, Deep wells, Geolo
Identifiers: *Champaign County(Ill), Diss minerals, Water bearing formations.

All available information was reported on pr tion wells used for public groundwater supp Champaign County. The definition of public supply as contained in the Environmental P tion Act of 1970 was used to determine those systems and wells to be included. Sand and deposits in the unconsolidated materials bedrock are tapped as the sources for 64 supply production and standby wells, rang depth from 26 to 340 ft. Reported yields from 25 to 3000 gpm depending primarily up type of well and the permeability, thickness areal extent of the sand and gravel unit tapp each well. Past and present analyses of wate these wells indicated that the iron content from 0.0 to 7.0 mg/l, and the hardness from 460 mg/l. Individual production wells fo

ly were described in the order of their con-
tion. The description for each well includes
aquifer tapped, date drilled, depth, driller,
location, elevation in feet above mean sea
, log, construction features, yield, pumping
ment, and chemical analyses. (Humphreys-
S)
05130

IC GROUNDWATER SUPPLIES IN CAL-
N COUNTY,
is State Water Survey, Urbana.
Woller.
able from the National Technical Informa-
ervice, Springfield, Va 22161 as PB-250 495,
in paper copy, $2.25 in microfiche. Bulletin
1975. 6 p, 1 fig.

iptors: *Water supply, *Illinois,
ndwater resources, *Well data, Uncon-
ted aquifers, Gravels, Sand aquifers,
dwater, Groundwater availability, Hydrolo-
ydrogeology, Water sources, Water quality,
wells, Municipal water, Water yield, Water
rties, Hardness(Water), Chemical proper-
hallow wells, Geology.
fiers: *Calhoun County(Ill), Dissolved
ls, Water bearing formations.

ailable information was reported on produc-
ells used for public groundwater supplies in
n County, Illinois. The definition of public
supply as contained in the Environmental
tion Act of 1970 was used to determine
water systems and wells to be included.
nd gravel deposits in the unconsolidated
ls above bedrock are tapped as the source
nicipal water supply. There are 7 municipal
tion and standby wells tapping these
s to depths ranging from 52 to 86.5 ft. Re-
yields range from 100 to 250 gpm, depend-
marily upon the type of well constructed
e permeability, thickness, and areal extent
sand and gravel unit tapped by these sup-
nge in iron content from a trace to 4.5 mg/1,
hardness from 373 to 656 mg/1, tapped by
stallation. Available chemical analyses in-
hat water from the sand and gravel aquifers
ual production wells for each supply were
ed in the order of their construction. The
tion for each well included the aquifer
date drilled, depth, driller, legal location,
n in feet above mean sea level, log, con-
n features, yield, pumping equipment and
l analyses. (Humphreys-ISWS)
131

C GROUNDWATER SUPPLIES IN MAS-
UNTY,
State Water Survey, Urbana.
oller.
le from the National Technical Informa-
vice, Springfield, Va 22161 as PB-250 453,
paper copy, $2.25 in microfiche. Bulletin
975. 8 p, 1 fig.

ors: *Water supply, *Illinois,
water resources, *Well data, Aquifers,
lidated aquifers, Gravels, Sand aquifers,
nes, Groundwater, Groundwater availa-
Hydrology, Hydrogeology, Water
s, Water quality, Water wells, Municipal
Water yield, Water properties, Hard-
ter), Chemical properties, Shallow wells,
lls, Geology.
rs: *Massac County(Ill), Dissolved
, Water bearing formations.

able information was reported on produc-
s used for public groundwater supplies in
County, Illinois. The definition of public
pply as contained in the Environmental
n Act of 1970 was used to determine
er systems and wells to be included. Un-
ted sand and gravel deposits associated
Ohio and Cache River Valleys and semi-

consolidated sand, silt, and gravel in the southern two-thirds of the county are tapped as sources of municipal water supplies. Seven public supply wells tap these aquifers to depths ranging from 96 to 270 ft. Their reported yields range from 94 to 1000 gpm depending primarily on the type of well constructed and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Past and recent analyses of water they produce indicated that the iron content ranges from 0.3 to 3.4 mg/1 and the hardness from 172 to 217 mg/1. A consolidated limestone aquifer of Mississippian age is tapped for public water supplies by four wells ranging from 240 to 448 ft deep. Reported yields range from 73 to 1800 gpm. Analyses of water they produce indicated that the iron content ranges from 0.3 to 3.4 mg/1 and the hardness from 200 to 280 mg/1. Individual production wells for each supply were described in the order of their construction. The description for each well includes the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment and chemical analyses. (Humphreys-ISWS)
W76-05132

EXPANSION OF SALT-WATER ZONE DUE TO WELL DISCHARGE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-05133

QUALITY OF WELL-WATERS OF NORTHERN MADHYA PRADESH,
College of Agriculture, Parbhani (India).
R. B. Somavanshi, and S. B. Sinha.
Indian J Agric Sci. 42(11): 1007-1010, 1972.

Descriptors: *Water quality, *Water wells, Asia, Irrigation water, Ions, Salinity, Cations, Anions, Alkalinity, *Calcium, *Magnesium, Sulfates, Carbonates, Chlorides, Boron, Nitrates, Groundwater.
Identifiers: *India(Northern Madhya Pradesh).

Samples of irrigation waters were collected from 117 places from Gwalior and Bhind, in the northern districts of Madhya Pradesh, India, and tested for suitability for irrigation. The dominating cations were the divalent ions Ca++ and Mg++, and the dominating anions were bicarbonate, chloride and sulfate. The concentration of B was within permissible limits, but that of nitrate varied widely. Some constants like SAR (Na Adsorption ratio), RSC (residual Na2CO3) and Kelly's ratio, which are generally used as indices of alkali hazard, were also calculated. Their values for most waters were within safe limits. A significant positive correlation existed between RSG and SAR, and between RSC and Kelley's ratio. More than 80% of the samples had low alkalinity, and 53% had no residual Na2CO3 at all. Of the samples, 94% had medium to high salinity, 4% had low and only 2% had very high salinity. The waters are of medium to high salinity but show low alkali hazard. Gwalior waters are better than Bhind waters for irrigation.--Copyright 1974, Biological Abstracts, Inc.
W76-05146

POLLUTION EFFECTS ON SURFACE AND GROUND WATERS, (LITERATURE REVIEW),
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05176

SOURCES OF CONTAMINATION OF ARTESIAN WATERS BY CARCINOGENIC HYDROCARBONS, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W76-05265

MEAN ANNUAL RUNOFF IN CENTRAL ASIA AND WESTERN KAZAKH DESERTS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2E.
W76-05304

GUIDELINES FOR THE SELECTION OF TURBINE PUMP MATERIALS FOR USE IN GROUNDWATERS,
Queensland Univ., Brisbane (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8G.
W76-05406

STRATIGRAPHIC AND HYDROLOGIC RELATIONSHIP OF THE PINEY POINT AQUIFER AND THE ALLOWAY CLAY MEMBER OF THE KIRKWOOD FORMATION IN NEW JERSEY,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 2F.
W76-05412

GROUND WATER DEVELOPMENT AND POTENTIAL IN WADIS KHULAYS AND FATIMAH, SAUDI ARABIA,
Geological Survey, Reston, Va.
P. E. Ward.
Open-file report, July 1975. 22 p, 2 fig, 4 ref.

Descriptors: *Groundwater potential, *Groundwater availability, *Water resources development, *Arid lands, *Foreign countries, Foreign research, Foreign projects, Hydrologic data, Reviews, Aquifer characteristics, Water supply, Groundwater recharge, Evaluation.
Identifiers: *Saudi Arabia(Wadis Khulays and Fatimah), Groundwater management.

Many of the wells and water distribution facilities supplying the cities of Jeddah and Mecca in Saudi Arabia were destroyed or severely damaged during the flooding in late March and early April 1975. The U.S. Army Corps of Engineers, who was repairing the damage, wanted to know if additional groundwater could be developed in Wadis Fatimah and Khulays where the well fields are located. Available information indicates that there has been a substantial overdraft of groundwater from Wadi Fatimah during the past few years. Any substantial increase in the withdrawal from Wadi Khulays will also result in overdraft. There appears to be potential for making additional groundwater available by retarding flow runoff in the wadis, thereby allowing the water more time to percolate to the groundwater reservoirs. (Woodard-USGS)
W76-05419

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-05420

GROUND-WATER DATA NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 7C.
W76-05424

DISTRIBUTION OF DIFFERENT QUALITIES OF UNDERGROUND WATERS IN REWARI TEHSIL OF HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 3C.
W76-05432

DESIGN OF GROUND WATER LEVEL OBSERVATION-WELL PROGRAMS,
Geological Survey, Raleigh, N. C. Water Resources Div.
R. C. Heath.
Ground Water, Vol. 14, No. 2, p. 71-77, March-April 1976, 4 fig., 2 tab.

Descriptors: *Observation wells, *Network design, Hydrologic data, Discharge measurement, Recharge, Measurement, Aquifers, Data collections, Water level fluctuations, Water wells, *Withdrawal, *Groundwater recharge.

Data obtained from observation-well programs are used to determine: (1) the effect of withdrawals on recharge and natural discharge conditions, (2) the hydraulic characteristics of ground-water systems, and (3) the extent and degree of confinement of aquifers. Wells in these programs can be divided into three networks: (1) a hydrologic network which includes wells needed to determine the extent of aquifers and changes in storage; (2) a water-management network which includes wells needed to determine the effect of withdrawals and hydraulic characteristics; and (3) a baseline network which includes wells needed to determine the response of ground-water systems to natural changes such as those related to climate. (Heiss-NWWA)
W76-05451

4C. Effects On Water Of Man's Non-Water Activities

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 7, POLICY AND REGULATORY DIMENSIONS,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05007

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 9, PRINCIPLES OF ECOSYSTEM MANAGEMENT,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05008

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 10, GROWTH AND LAND USE, STUDY NO. 11, ECONOMIC IMPLICATIONS OF LAND DEVELOPMENT ALTERNATIVES, STUDY NO. 12, A SIMULATION MODELING APPROACH TO THE STUDY OF DEVELOPMENT ALTERNATIVES,
For primary bibliographic entry see Field 5G.
W76-05009

THE IMPACT OF SALT MANUFACTURING ON MANGROVE VEGETATION AND THE GEOMORPHOLOGY IN LOWER-DAHOMEY, (IN FRENCH),
Dahomey Univ., Porto Novo. Botany Lab.
G. Paradis, and E. Adjanohoun.
Ann Univ Abidjan Ser E Ecol. 7: 599-612. 1974.

Descriptors: *Salts, *Vegetation, Industries, Marshes, Geomorphology, Erosion, Organic soils, *Mangrove mashes, Grasslands, *Grasses.
Identifiers: Avicennia, Paspalum-Vaginatum, Rhizophora, Sesuvium-Portulacastrum, *Mangrove trees, *Dahomey (France).

The salt industry in Dahomey, which has been traced back to at least 1734, has contributed to a change in the appearance of mangrove trees in Dahomey. There has been great destruction of Rhizophora and Avicennia, and they have been replaced by grasslands with Paspalum Veginatum and Sesuvium portulacastrum. The geomorphology has also been affected, with creation of marshes and buttes, and probable erosion of the organic soil. Copyright 1975, Biological Abstracts, Inc.
W76-05113

PETROLEUM INPUTS TO THE MARINE ENVIRONMENT FROM LAND SOURCES,
Engineering-Science, Inc., Berkeley, Calif
For primary bibliographic entry see Field 5B.
W76-05140

ESTIMATES OF ANNUAL INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT FROM OFFSHORE PRODUCTION OPERATIONS,
Exxon Production Research Co., Houston, Tex. Geologic Research.
For primary bibliographic entry see Field 5B.
W76-05142

WESTERNPORT BAY ENVIRONMENTAL STUDY 1973-1974.
Victoria Ministry for Conservation, Melbourne (Australia). Westernport Bay Environmental Study.
For primary bibliographic entry see Field 6G.
W76-05404

COUPLED SOIL MOISTURE, HEAT AND WATER VAPOUR TRANSFERS UNDER SIMULATED FIRE CONDITIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2G.
W76-05410

EFFECTS OF LAND USE AND RETENTION PRACTICES ON SEDIMENT YIELDS IN THE STONY BROOK BASIN, NEW JERSEY,
Geological Survey, Ithaca, N.Y.
L. J. Mansue, and P. W. Anderson.
Water-Supply Paper 1798-L, 1974. 33 p, 11 fig, 8 tab, 20 ref.

Descriptors: *Sediment transport, *Sediment yield, *Particle size, *Small watersheds, *New Jersey, Sedimentation, Environmental effects, Land use, Construction, Urbanization, Agriculture, Streamflow, Storms, Data collections, Sediment control.
Identifiers: *Stony Brook basin(NJ).

The average annual rate of suspended-sediment discharge of the Stony Brook at Princeton, N.J. (44.5 square miles) is about 8,800 tons, or 200 tons per square mile. Annual yields within the basin, which is in the Piedmont Lowlands section of the Piedmont physiographic province in west-central New Jersey, range from 25 to 400 tons per square mile. Storm runoff that transport suspended materials in excess of a ton carries 90 percent of the total suspended-sediment discharge from the basin. Suspended material carried during storms is 55 percent silt, 40 percent clay, and 5 percent sand. A trend analysis of sediment records collected at Princeton between 1956 and 1970 indicated an increase in suspended-sediment discharge per unit of water discharge during 1956-61. From early 1962 to late 1967, sediment trends were difficult to interpret owing to complicating factors, such as reservoir construction, urbanization, and extreme drought. After 1967, yields decreased. (Woodard-USGS)
W76-05418

4D. Watershed Protection

GEOHYDROLOGY OF KARST TERRA LOST RIVER WATERSHED, SOUTHERN IN ANA,
Indiana Univ., Bloomington, Water Resour Research Center.
For primary bibliographic entry see Field 2F.
W76-05004

EFFECTS OF LAND USE AND RETENT PRACTICES ON SEDIMENT YIELDS IN T STONY BROOK BASIN, NEW JERSEY,
Geological Survey, Ithaca, N.Y.
For primary bibliographic entry see Field 4C.
W76-05418

WATER RESOURCES OF THE MISSISS AND SAUK RIVERS WATERSHED, CENT MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-05428

WATER RESOURCES OF THE HURON RI BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Grayling, Mich.
For primary bibliographic entry see Field 7C.
W76-05429

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ROOKERY BAY LAND USE STUDIES, VIRONMENTAL PLANNING STRATE FOR THE DEVELOPMENT OF A MANGI SHORELINE, STUDY NO. 3, ESTUA WATER QUALITY,
Conservation Foundation, Washington, D. C
For primary bibliographic entry see Field 5G
W76-05005

PHYSICOCHEMICAL TRANSFORMAT OF SEWAGE EFFLUENT RELEASES I EPHEMERAL STREAM CHANNEL,
Arizona Univ., Tucson. Dept. of Hydrolog Water Resources.
P. G. Sebenik.
Available from the National Technical In tion Service, Springfield, Va. 22161, as I 130, $5.50 in paper copy, $2.25 in micro Master of Science Thesis, 1975, 88 p, 17 fig, 50 ref. OWRT A-040-ARIZ(1).

Descriptors: *Physicochemical prop *Sewage effluents, *Waste water(Pol *Sewage disposal, *Nitrogen *Mathematical models, Biological prop Chemical analysis, Water pollution s Sewage, Nitrates, Sewage treatment, Wate ty, Nitrogen fixation, Nitrification, Nitroge pounds, Nitrogen fixing bacteria, Co models, Hydrographs, Hydrogen ion con tion, Ephemeral streams, Water po Groundwater.
Identifiers: *Nitrogen transformation, Kin wave model.

The overall objective was to examine transformations occurring within the San River channel (a desert stream located ne son, Arizona) during sewage effluent relea the channel. An attempt is made to char spatial and temporal changes in the physi chemical composition of sewage downstream, to evaluate various mathe

lels for prediction of sewage effluent hydro-
hs and nitrogen species transformations oc-
ing at various downstream locations, and com-
actual and predicted values of sewage ef-
nt hydrographs and nitrogen species transfor-
ons for specific models. Water quality sam-
were taken in sequence so that incremental
s at different hydrograph stages could be
ed as the effluent moved downstream. Hydro-
hs obtained from two H-L flumes were used
libirate a modified kinematic wave model and
aulic parameters from the kinematic model
physicochemical measurements from water
ty samples were combined into a statistical-
rical kinetic model of nitrogen trasformations
h may occur in sewage effluent releases. Fair
ement was found between the nitrogen species
s calculated with the model and the measured
Measured nitrogen species values indicated
the rate of nitrification in sewage effluent
sees is related to flow distance and physical
cteristics of the stream. A review of the
gen cycle and nitrogen transformation
sses is included. (Robinett-Arizona)
05018

LUATION OF WATER LABORATORIES, OMMENDED BY THE UNITED STATES IC HEALTH SERVICE.
Health Service, Washington, D.C. Bureau
te Services.
rimary bibliographic entry see Field 5G.
05041

LOT STUDY OF DRINKING WATER EMS AT BUREAU OF RECLAMATION LOPMENTS.
onmental Protection Agency, Washington,
Water Supply Div.
imary bibliographic entry see Field 5F.
5043

RFERENCES IN THE ELEC-NALYTICAL DETERMINATION OF ER AND LEAD IN WATER AND WASTE R,
rsity of Strathclyde, Glasgow (Scotland).
of Civil Engineering.
nes, B. G. Cooksey, B. Metters, and C.
s.
dings of the Analytical Division of The
cal Society, Vol. 12, No. 9, p 251-252, Sep-
, 1975. 2 fig, 1 tab, 10 ref.

tors: *Copper, *Lead, *Waste Pollution), *Pollutant identification, tions, Acidity, Sewage, Analytical ues, Chemical analysis, Activated sludge, size, Centrifugation, Polarographic analy-ter analysis.
ers: *Electroanalysis, Anodic stripping try, Calibration graphs.

metals can exist in aqueous solutions in dis- precipitated, complexed, and adsorbed Toxicity, treatment efficiency, and concen-determinations are affected by the form. nalytical techniques are useful in that they sitive, non-destructive, and informative. of final effluent from an activated sludge were analyzed by d. c. polarography, tripping voltametry, particle size analysis, mic absorption spectrometry. Lead was o the sewage at concentrations of 1-20 r million (ppm), and these solutions were by d. c. polarography. The lead did not free soluble form at pH 7. The calibration were curved. When the acidity was in-the calibration graphs were straight lines. results were obtained with copper. At ncentrations of lead, anodic stripping vol- was used. Calibration graphs still were t a pH of 7, and became straight lines solution acidity was raised. Graphs for ed samples were more linear than for un-

centrifuged samples. Combined particle size analysis, centrifugation and suspended solids addition showed that adsorption can occur at low concentrations (on the order of parts per billion). At higher concentrations, the adsorption sites are saturated. The chemical form of metals in solution is dependent upon: pH; the concentration of the metal; the amounts of organic material and suspended solids; and the concentration and type of anion. (Pinto-FIRL)
W76-05045

AUTOMATED DETERMINATIONS OF DISSOLVED ORGANIC CARBON IN LAKE WATER,
Canada Center for Inland Waters, Burlington, (Ontario).
P. D. Goulden, and P. Brooksbank.
Analytical Chemistry, Vol. 47, No. 12, p 1943-1946, October, 1975. 2 fig, 2 tab, 5 ref.

Descriptors: *Organic materials, *Automation, *Analytical techniques, *Water analysis, *Great Lakes, Carbon dioxide, Ultraviolet irradiation, Oxidation, *Pollutant identification, Carbon.
Identifiers: *Dissolved organic carbon(DOC).

Several automated methods for the determination of dissolved organic carbon (DOC) in water from the Great Lakes were compared. Dissolved organic material, which may represent degradation of animal or plant products, or pollution by sewage, is measured by the oxidation of the organic material with subsequent measurement of carbon dioxide. Inorganic carbonate must be removed prior to the oxidation step. In these examples, the inorganic carbonate was removed by stripping the carbon dioxide from an acidified sample in a heated packed column. The two alternative methods of oxidation were compared, using ultraviolet irradiation and silver-catalyzed peroxydisulfate at 95 C. It was found that ultraviolet irradiation will oxidize all the organic materials. The silver-catalyzed peroxydisulfate method was convenient and precise but oxidized only 97% of the naturally occurring organic materials. For all the systems, using wet oxidation for high sensitivity, the limit for detection of carbon was 10 micrograms/liter and the analysis rate was 20 samples per hour. (Kramer-FIRL)
W76-05047

POTABLE WATER QUALITY IN RURAL GEORGETOWN COUNTY,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
S. S. Sandhu, P. Nelson, and W. J. Warren.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 4, p 465-472, October, 1975. 1 fig, 3 tab, 20 ref.

Descriptors: *Water quality, *South Carolina, *Potable water, Chemical analysis, *Pollutant identification, *Rural areas, Inorganic compounds, Waste water(Pollution).
Identifiers: Georgetown County(SC).

The drinking water quality of rural homes and communities in Georgetown County, South Carolina, was investigated in order to determine: the level of inorganic constituents; whether they exceed federally recommended limits; and whether pollution sources can be identified. Drinking water supplies in 161 rural communities were selected for sample collection. Samples were chosen that had not been chlorinated or otherwise pretreated. Samples were analyzed according to standard methods for pH, temperature, chlorides, nitrates, total residues, turbidities, sodium, fluoride, copper, iron, manganese, zinc, and mercury. Results showed that most of the waters were slightly acidic. Low but acceptable concentrations of chloride, copper, fluoride, sodium, cadmium, nitrate, and phosphate were found. Some water samples showed higher than recommended levels of arsenic, mercury, zinc, and lead. Two percent of the samples exceeded the mandatory limit of 0.05 parts per million (ppm) for arsenic, and 72% exceeded the recommended level of 0.01 ppm. Mandatory limits for manganese and iron were exceeded in 37% and 88% of the waters, respectively. The high iron content was responsible for the high turbidity found in 45% of the samples. Well depth and consumer income affected water quality. Septic tank seepage was partially responsible for nitrate, phosphate, iron, and arsenic contaminations. Lead concentrations depended on the plumbing and the pH. (Pinto-FIRL)
W76-05050

COMPARATIVE ATOMIC ABSORPTION SPECTROSCOPIC STUDY OF TRACE METALS IN LAKE WATER,
Limnetics, Inc., Milwaukee, Wis.
T. Surles, J. R. Tuschall, and T. T. Collins.
Environmental Science and Technology, Vol. 9, No. 12, p 1073-1075, November, 1975. 3 tab, 10 ref.

Descriptors: *Trace elements, *Metals, Spectroscopy, Chemical analysis, *Pollutant identification, Chelation, *Lake Michigan, *Analytical techniques, Instrumentation.
Identifiers: *Atomic absorption spectroscopy, Flameless atomic absorption spectroscopy, Chelation/extraction technique, Perkin-Elmer Model 306, Deuterium Background Corrector.

The advantages of flameless atomic absorption spectroscopy over the conventional flame technique include: lower detection limits; less sample pretreatment; smaller sample size; rapid analysis; and a greater variety of samples. However, there is still controversy over the precision and accuracy of the flameless technique. The precision and accuracy of the flameless method as compared to the flame technique and the chelation/solvent extraction method is demonstrated. A Perkin-Elmer Model 306 atomic absorption spectrophotometer was used with a Deuterium Background Corrector in the study. Nitric acid was used as a final cleaning agent. Composite water samples were taken from six different locations along Lake Michigan's western shoreline. The chelation/extraction method and the flameless method were used to determine the concentrations of cadmium, zinc, copper, chromium, manganese, lead, and nickel in the water. It was possible to analyze wide ranges or concentrations without prior dilution or concentration with the flameless method. In order to work in the same range as the flameless method, the chelation/extraction method required tedious preconcentration of the sample. Concentrations for some of the metals were too low to be determined by the chelation/extracton method. One problem with this method is the probable loss of metal in the chemical procedure of the extraction technique. When radioactive cadmium was used as a sample, the flameless technique showed results that were in better agreement with radioactive techniques than did the chelation/extraction method. (Pinto-FIRL)
W76-05051

SEASONAL OCCURRENCE AND DISTRIBUTION OF MICROBIAL INDICATORS AND PATHOGENS IN THE RHODE RIVER OF CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-05052

THE RATE OF PSYCHROPHILIC AND MESOPHILIC BACTERIA IN DIFFERENTLY POLLUTED WATERS OF BUDAPEST (A PSYCHROPHIL ES A MESOPHIL BAKTERIUMOK SZAMANAK ARANYA KUELOENBOEZO SZENNYEZETTSEGII BUDAPESTI VIZEKBEN),
L. Nemedi, and G. Petrasko.

Egeszsegtudomany, Vol. 19, No. 3, p 239-525, 1975. 2 fig, 4 tab, 23 ref.

Descriptors: *Waste water treatment, *Bacteria, *Water quality, *Water pollution, Analytical techniques, *Pollutant identification.
Identifiers: *Mesophilic bacteria, *Psychrophilic bacteria.

The kinetics of psychrophilic and mesophilic bacteria populations in water with different levels of pollution were studied. Two different culturing techniques for bacteria enumeration were employed. The mean values of bacterium counts were found to be consistently higher with gelatin plate pouring (incubationat 20 C for 4 days) than with agar plate pouring (incubation at 37 C for 2 days). Because of this variation, the hygienic limit values of the two parameters can not be determined in identical values. The psychrophilic count was found to be more strongly correlated with the fecal pollution of waters than was the mesophilic count. The proportion of psychrophilic and mesophilic bacterium counts varied between 3.2 and 20. The relative frequency of the two bacteria populations observed in the polluted waters of Budapest is presented. The extent to which the different culturing methods might modify the water analysis based on the bacterium count is discussed. It is stressed that the hydrobiological and hygienic value of the bacterium count varies. (Orr-FIRL)
W76-05053

TOTAL OXYGEN DEMAND,
Northumbrian Water Authority, Gosforth (England).
B. D. Ravenscroft.
Proceedings of the Analytical Division of the Chemical Society, Vol. 12, No. 9, p 254-255, September, 1975.

Descriptors: *Oxygen, *Biochemical oxygen demand, *Chemical oxygen demand, Chemical analysis, Waste water(Pollution), *Pollutant identification, Equipment, Instrumentation, Measurement, Carbon, Analytical techniques.
Identifiers: Permangate value, Total carbon, Total organic carbon, *Total oxygen demand.

Deficiencies and delays in classical methods of oxygen demand measurements on waste water and new rapid determination methods are discussed. Biochemical oxygen demand (BOD), chemical oxygen demand (COD), and permangate value (PV) measurements have given way to total carbon (TC), total organic carbon (TOC) and total oxygen demand (TOD) techniques. In the TOD instrument discussed, the sample is catalytically burned at 900 C with a small and constant stream of oxygen. This instrument is more accurate in the 0-500 mg/liter of TOD and 0-1000 mg/liter of TOD ranges than in the 0-50 mg/liter of TOD range. Dissolved and suspended solids can be handled with this instrument, as long as they are smaller than 200 microns. The oxidation efficiency at 900 C for the TOD measurements is greater than that for the COD measurements. Dissolved oxygen and nitrates in the sample will interfere with TOD measurements, and so must be either corrected for or eliminated. Effects from other anions are negligible. Heavy metals may poison the catalyst. Correlations between TOD, COD, and BOD are dependent on the composition of the waste water being studied. Industrial applications include: on-line operation to protect from spills; detection of losses where expensive products are made; and industrial final effluent monitoring. (Pinto-FIRL)
W76-05056

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland). Control of Environmental Pollution and Hazards.
For primary bibliographic entry see Field 5G.
W76-05061

THE USE OF ADENOSINE TRIPHOSPHATE MEASUREMENTS IN THE CONTROL OF THE ACTIVATED SLUDGE PROCESS BY THE SOLIDS RETENTION TIME METHOD,
University Coll., Cardiff (Wales). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-05065

COMPARISON OF THE NEW MILLIPORE HC WITH CONVENTIONAL MEMBRANE FILTERS FOR THE ENUMERATION OF FECAL COLIFORM BACTERIA,
Massachusetts Univ., Waltham. Dept. of Environmental Sciences.
B. L. Green, E. Clausen, and W. Litsky.
Applied Microbiology, Vol. 30, No. 4, p 697-699, October, 1975. 3 tab, 2 ref.

Descriptors: *Coliforms, *Pollutant identification, *Analytical techniques, Laboratory tests, *Membranes, Public health, Standards, Water quality control.
Identifiers: *Membrane filters, Millipone HC membranes.

Membrane filters currently used to determine the extent of fecal coliform pollution have a retention pore size of 0.45 micrometers and varying surface pore diameters. It has been shown that the recovery of fecal coliforms could be increased by modifying the surface pore morphology of the membrane. In this investigation, fecal coliform recovery from polluted water using six types of commercially available membrane filters was compared. The samples were taken from nonchlorinated sewage effluent, and surface waters receiving sewage, farm runoff, and industrial waste water. The membranes tested included: Millipore HA; Millipore HC; Gelman GN-6; Schleicher & Schuell; Sartorius nitrocellulose; and, Johns-Manville. The mean fecal coliform counts on the six test filters are presented. Confirmation ranged from 91.0 to 93.8 percent and indicated no significant differences between the membranes. A statistical analysis performed on the observed differences in count showed that no significant differences between variances of different filter types, however, the differences in mean count were highly significant. The membrane types can be ranked in order of fecal coliform recovery as follows: Millipore HC>Gelman>Johns-Manville and Sartorius>Millipore HA>Schleicher & Schuell. (Orr-FIRL)
W76-05069

ELEMENTAL ANALYSIS OF WASTEWATER SLUDGES FROM 33 WASTEWATER TREATMENT PLANTS IN THE UNITED STATES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-05080

PRELIMINARY SUMMARY OF SLUDGE DEGRADATION STUDIES IN A MARINE BENTHIC ENVIRONMENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-05086

BIOASSAY METHODS AND IMPACT EVALUATION OF OCEAN DISPOSAL SITES,
Mounmouth Coll., West Long Branch, N. J.
D. Dorfman, and J. M. McCormick.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 391-415. 4 fig, 2 tab, 23 ref.

Descriptors: *Bioassay, *Sludge dispos *Disposal, Effluents, Biochemical oxygen mand, Chemical oxygen demand, Dissolved ygen, Benthic flora, Benthic fauna, Water tab Waste disposal, Toxins, Nutrients, Pollut identification.
Identifiers: *Impact evaluation, Land dispo *Ocean disposal sites, Sub-lethal tests.

Some disadvantages of land disposal of efflue and sludges include lack of adequate space; verse effects on the water table; aesthetics; high costs. Discharges into ocean waters probably expand in the future but the ocea capacity for wastes is not limited. Large quanti of ocean disposed effluents and sludges can re in increased nutrients and toxicants, biochem and chemical oxygen demand, direct or indi reduction in the dissolved oxygen, altered sa ties, increased turbidity and temperatu smothered benthic organisms, and a numbe synergistic and antagonistic reactions. Bioas methods and impact evaluation techniques in t tion to these problems are discussed. A numbe both laboratory and field procedures are avail to perform bioassays, but to perform them marine water some modifications are neces due mainly to the presence of salt water and quality of the waters. Two types of bioassays considered. A static bioassay is one in which test organisms are maintained in vessels con ing solutions of various dilutions of the t material. In the flow through bioassay the solution is allowed to flow in and out of the v containing the test organisms, maintaining a stant chemical environment. This is preferre long term assays. Sub-lethal tests that can be formed include biochemical studies, patholo studies, physiological studies, growth stu behavior studies, photosynthesis studies and tests. Field observations can provide the direct evidence of the effects of ocean was the flora and fauna. A multidisciplinary appr using both field and laboratory tests appears the most satisfactory. (See also W76-05079) (F FIRL)
W76-05087

MODEL 6-D IN-SITU WATER QUA ANALYZER (SURVEYOR) HYDROLAB PORATION, AUSTIN, TEXAS 78766.
National Oceanic and Atmospheric Admin tion, Washington, D. C.; and National Ocean vey, Rockville, Md.
Available from the National Technical Info tion Service, Springfield, Va. 22161, as CO 10016, $3.25 in paper copy, $2.25 in micro National Oceanographic Instrumentation C Instrument Fact Sheet, IFS-75004, October, 15 p, 7 fig.

Descriptors: *Instrumentation, *Anal techniques, Water quality, *Dissolved ox *Hydrogen ion concentration, *Temper *Conductivity, Operation, Model studies, quality control, Equipment, *Pollutant iden tion.

This fact sheet describes the Hydrolab Co tion's Model 6D In-situ Water Quality An (Surveyor). The instrument system is portab measures conductivity, temperature, dissolv ygen, and pH. Each parameter is measure separate sensor contained within the unde housing or Sonde. Operating power is suppl a surface control unit and a signal output played on a panel meter. Details are provi the manufacturer's specifications, perfor tests, environmental tests, and on the functi the National Oceanographic Instrume Center. (Kramer-FIRL)
W76-05091

DETECTION OF SALMONELLAE IN TH VIRONMENT,
Center for Disease Control, Atlanta, Ga.
B. M. Thomason, J. W. Biddle, and W. B. C

ed Microbiology, Vol. 30, No. 5, p 764-767. mber, 1975. 4 tab, 9 ref.

riptors: *Salmonella, *Environmental ef- *Pollutant identification, Hazards, orms, Forests, Mountains, Granites, Hard- Public health, Water pollution effects. fiers: Granite mountain, Hardwood forest.

been suggested that salmonellae may be free in nature since they have been found in s devoid of fecal contamination. They may e a better indication of a health hazard than ndard coliform count. The incidence of sal- lae in a harsh and unfavorable environment etermined as compared with that of a lush ood forest characterized by abundant re and moderate temperature. Samples aken from two sites: one was a mature hard- forest which is protected against casual intervention but which had many warm and looded vertebrates; the other the top of a mountain which receives heavy human but can support only a small animal popula- ater, algae, mosses, tree roots, grasses, and ere collected for sampling. Samples col- in the lush hardwood forest yielded four sal- ae serotypes from six culturally positive s. Out of a total of 76 samples collected at of the granite mountain over a three month 10 were positive. Only two salmonellae es were isolated, and one of these was iso- nly once. The detection of salmonellae was ndent of the nature of the material collected lyzed for the two sites, but the presence or e of visible moisture had a significant effect recovery of salmonellae. Even a harsh en- ent can serve as an ecological niche for the l and trasmission of salmonellae. (Pinto-

100

IOLECULAR WEIGHT DISTRIBUTION LUBLE ORGANICS IN SEWAGE AND E EFFLUENTS USING GEL FILTRA-

- The State Univ., New Brunswick, N. J. nary bibliographic entry see Field 5D. 101

/AL OF TRACE LEVELS OF 2- LAMINOFLUORENE (2-AAF) FROM WATER,

Center for Toxicological Research, Jef- Ark.

ary bibliographic entry see Field 5D. 17

GROUNDWATER SUPPLIES IN AIGN COUNTY,

tate Water Survey, Urbana.

ary bibliographic entry see Field 4B. 30

GROUNDWATER SUPPLIES IN CAL- OUNTY,

tate Water Survey, Urbana.

ry bibliographic entry see Field 4B. 31

GROUNDWATER SUPPLIES IN MAS- NTY,

ate Water Survey, Urbana.

ry bibliographic entry see Field 4B. 2

OUND PAPERS FOR A WORKSHOP UTS, FATES, AND EFFECTS OF EUM IN THE MARINE ENVIRON- OLUME I.

Research Council, Washington, D.C. airs Board.

ry bibliographic entry see Field 5B.

W76-05135

INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT DIRECTLY FROM THE ATMOSPHERE,
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5B.
W76-05138

EUROPEAN EXPERIENCE IN THE IDENTIFICATION OF WATERBORNE OIL,
Shell Research Ltd, Chester (England). Thornton Research Center.
E. R. Adlard.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 111-133, May 1973. 3 fig, 1 tab, 27 ref.

Descriptors: *Pollutant identification, *Oil wastes, *Oil pollution, *Analytical techniques, *Europe, Chemical analysis, Water pollution, Water pollution sources, Pollutants, Chromatography, Gas chromatography, X-ray fluorescence, Neutron activation analysis, Spectroscopy, Laboratory tests. Testing procedures.

European experience in the identification of waterborne oil can be said to date from March 18, 1967, when the Torrey Canyon went aground. There had been many oil spills around the coast of the British Isles before that date, but they had been relatively small and infrequent. The two main conclusions reached in Europe since then on pollutant analysis were: (1) no single technique exists sufficient for pollutant identification and, in general, several complementary methods must be used; and (2) the exact scheme of analysis used may have to be varied from sample to sample depending on the particular circumstances of each case. A general scheme of oil pollutant analysis was described. The analysis scheme proposed uses X-ray fluorescence analysis, emission spectrometry, gas chromatography, infra-red spectroscopy, and other techniques. (See also W76-05135) (Sims - ISWS)
W76-05143

MEASUREMENT OF HYDROCARBONS IN WATER AND SEDIMENT,
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
R. A. Brown.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 133a-151, May 1973. 2 tab, 35 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Oil, *Chemical analysis, Analytical techniques, Water pollution, Oil pollution, Pollutants, Oceans, Water, Sediments, Measurement, Sampling, Laboratory tests, Volatility, Testing procedures.
Identifiers: *Volatile hydrocarbons, *Non-volatile hydrocarbons.

Methods to determine hydrocarbons in water and sediment were described. Techniques covered sample collection and storage and the measurement of hydrocarbons as individual compounds or as a total. An analytical method intended to measure volatile hydrocarbons will probably be unsuitable for nonvolatiles and vice versa. Thus, more than one procedure is required to measure the whole range of crude oil hydrocarbons in a given sample. Just as a single method may not handle both volatile and nonvolatile hydrocarbons, neither will a single method usually handle the complete range of concentration that is encountered in practice. It is more difficult to measure inordinately small quantities, for example (See also W76-05135) (Sims-ISWS(
W76-05144

METHODS FOR POLYNUCLEAR AROMATIC
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
R. A. Brown.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 151a-157, May 1973. 2 tab, 13 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Oil, *Analytical techniques, Chemical analysis, Pollutants, Laboratory tests, Testing procedures, Measurement, Gas chromatography, U ltraviolet radiation, Oil pollution, Water pollution, Marine animals.
Identifiers: *Polynuclear aromatic hydrocarbons.

The 1950's saw the initial major effort occur on the development of methods to identify and measure polynuclear aromatic (PNA) hydrocarbons. Principal attention was directed at air particulates, tobacco smoke, and tar. Benzo(a)pyrene received major attention and still does. By the mid-1960's many papers had appeared on methods of analysis. Petroleum has received relatively little attention in comparison with cigarette smoke and air particulates. Petroleum products of early interest include mineral oils used in food processing and wax used in food packaging. The safe use of these materials has been demonstrated by showing the essential absence of PNAs. Some recent research problems have required simpler and faster methods based on gas chromatography. Almost directly applicable to petroleum is a method for measuring PNAs in coke overn efluents. This procedure, called the GC/UV method, was improved upon to handle tar from auto exhaust gas, gasoline, and used crankcase oil. In practice, a sample is tagged with C14 benz(a)anthracene and benzo(a)pyrene, treated with aqueous caustic and chromatographed on partially deactivated alumina. A portion of the resulting PNA concentrate is injected into a gas chromatograph and individual peaks are trapped. The amounts of PNAs in the trapped fractions are measured by UV absorption spectrophotometry. (See also W76-05135) (Sims - ISWS)
W76-05145

QUALITY OF WELL-WATERS OF NORTHERN MADHYA PRADESH,
College of Agriculture, Parbhani (India).
For primary bibliographic entry see Field 4B.
W76-05146

THE QUANTITATIVE DETERMINATION OF TRACE CONCENTRATIONS OF PETROLEUM-DERIVED POLLUTANTS IN THE OCEAN,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia) Atlantic Oceanographic Lab.
E. M. Levy.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 192-223, May 1973. 24 ref, 1 append.

Descriptors: *Pollutant identification, *Oil, *Chemical analysis, *Oceans, Analytical techniques, Oily water, Oil pollution, Pollutants, Ultraviolet radiation, Infrared radiation, Spectrophotometry, Gas chromatography, Sampling, Laboratory tests, Testing procedures.
Identifiers: Tar balls.

The problem of determining trace concentrations of petroleum pollutants that are dissolved and/or dispersed through the water column and floating as particles on the surface of the ocean was

discussed. Techniques for sampling and extraction were outlined briefly while the advantages and limitations of gravimetric procedures; ultraviolet absorption, ultraviolet fluorescence, and infrared absorption spectrophotometry; and elemental analyses and gas chromatography for the quantification of the low levels that are present in the open ocean were discussed in some detail. Existing information concerning the distribution of petroleum pollutants in the open ocean were reviewed. (See also W76-05135) (Sims-ISWS)
W76-05147

PARTITIONING OF HYDROCARBONS BETWEEN THE ATMOSPHERE AND NATURAL WATERS,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5B.
W76-05149

IDENTIFICATION OF WATERBORNE OILS,
Shell Development Co., Houston, Tex. Bellaire Research Center.
F. T. Weiss.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 290a-306, May 1973. 1 fig, 1 tab, 32 ref.

Descriptors: *Pollutant identification, *Oil spills, *Chemical analysis, *Analytical techniques, Oil, Oil pollution, Oily water, Pollutants, Chemistry, Sampling, Testing procedures, Laboratory tests, Gas chromatography, Spectroscopy, Weathering, Trace elements.

This review was prepared to consider and compare the principal techniques for the identification of waterborne oils, based largely on experience in the United States. A tabular summary was included to indicate the significance of the important features of each of the techniques. Some material was also presented on the important and practical aspects of sample collecting, preservation, and treatment prior to actual analysis. (See also W76-05135) (Sims-ISWS)
W76-05150

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER - PHASE II,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8G.
W76-05180

NUTRIENT DYNAMICS AND GAS PRODUCTION IN AQUATIC ECOSYSTEMS: THE EFFECTS AND UTILIZATION OF MERCURY AND NITROGEN IN SEDIMENT-WATER MICROCOSMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W76-05246

RESIDUE-REMOVAL METHODS FOR PESTICIDES AND INDUSTRIAL CHEMICALS FOUND IN AQUATIC ENVIRONMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biochemistry and Nutrition.
R. W. Young, O. D. Parr, and J. K. Dickinson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 747, $3.50 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 90, December 1975. 20 p, 2 tab, 5 charts, 11 ref. OWRT A-057-VA(1).

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Chromatography, *Pesticide residues, Gas chromatography, Aroclors, Separation techniques, Analytical techniques, *Pollutant identification, Chemicals, Carbamate pesticides.
Identifiers: *Carbamate silylation, Chlorophacinone.

This research evaluated various methods that have been advanced for separation of polychlorobiphenyls from chlorinated pesticides, to see which were effective in detecting and removing these residues often present in the aquatic environment. Preliminary investigations also were made of a new approach, the silylation of carbamates. Finally, a gas chromatographic (GLC) procedure for chlorophacinone (CPN) was developed by brominating the parent compound.
W76-05249

NATURALLY OCCURRING ORGANIC COMPOUNDS AND ALGAL GROWTH IN A EUTROPHIC LAKE,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W76-05253

STRATEGY OF BIOLOGICAL MONITORING, (IN RUSSIAN),
V. D. Fedorov.
Biol Nauki. 17(10): 7-17, 1974.

Descriptors: *Bioindicators, *Monitoring, Ecology, *Environmental effects, Water pollution effects, Data collections, *Pollutant identification, Environmental control.

Biological monitoring is a system of long-term observations of environmental changes with respect to a number of indices established by a program. The problem of monitoring, monitoring systems and problems of strategy are examined. Monitoring for pollution and biospheric changes which could be harmful to humans and the ecological aspects of pollution are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-05301

METHOD AND MEANS FOR MONITORING THE QUANTITY OF DISPERSED OIL IN WATER,
F. B. Rosso, and R. H. Ross.
Canadian Patent 960,060. Issued December 31, 1974. The Patent Office Record, Vol. 103, No. 53, p 14, December, 1974.

Descriptors: *Industrial wastes, *Patents, Oils, Oily water, Emulsions, *Monitoring, Measurement, Ultraviolet radiation, Analytical techniques, *Pollutant identification.

The patented method and means for monitoring the quantity of dispersed oil in water is described. The system includes a source of ultraviolet light for transmission of light through a sample of the oily water, a chamber for containing the sample of liquid being analyzed, a photocell for translating ultraviolet light transmitted through the sample into an electrical signal, circuit and registration means for compensating and utilizing the signal, and a reciprocating wiper for maintaining the interior walls of the sample chamber in a clean, and suitably ultraviolet-transparent condition. The reciprocating wiper is a piston with conduits within it for introducing oil solvent to the walls of the chamber to facilitate the removal of oil resources. The output of the source of ultraviolet light is stabilized by a circuit provided. (Orr-FIRL)
W76-05338

HYGIENIC ASSESSMENT OF CERTAIN SURFACE-ACTIVE SUBSTANCES-THE COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES (GIGIYENICHESKAYA OTSENKA NEKOTO-RYKH POVERKHNOST-NOAKTIVNY VESHCHESTV-KOMPNENTOV STOCHNY VOD PREDPRIYATIY TEKSTIL'NOY P MYSHLENNOSTI),
E. A. Kordysh, and M. M. Ratpan.
Gigiyena i Sanitariya, No. 10, p 16-20, 1974.

Descriptors: Waste water treatment, *Indu wastes, *Textiles, Toxicity, Bioassay, L limit, Pulp wastes, Pollutant identification.
Identifiers: Maximum allowable concentratio

The complex sanitary-toxicological assessme four components of effluents from textile (stearox-6, 0C-20 (non-ionogenic surface-a substances), alkamon 0C-2, and thee smoo compound A (cation-active complexes presented. With respect to the effect on the purification of water bodies as a hyg criterion, the maximum allowable concentra were determined to be one mg/liter for alk 0C-2 and the smoothing compound A, a mg/liter for 0C-20 and stearox-6. The LD50 v were determined to be in a range of 1,320- mg/kg for mice, and in a range of 3,100- mg/kg for rats, however, stearox-6 was pract non-toxic. The noeffect levels were found mg/kg for 0C-2, one mg/kg for the smoothing pound A, and 15 mg/kg for 0C-20. In water b their limiting property was determined to b formation of foam. Based on this criteria, the imum allowable concentrations of 0C-20, alk 0C-2, the smoothing compound A, and ste have been established at 0.1; 0.5; 1; an mg/liter, respectively. (Takacs-FIRL)
W76-05342

CHEMICAL QUALITY AND TEMPERA OF WATER IN FLAMING GORGE R VOIR, WYOMING AND UTAH, AND TH FECT ON THE RESERVOIR ON THE G RIVER,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2H
W76-05417

WATER RESOURCES OF BASINS FOR M STREAMS DRAINING INTO ST. CLAIR R LAKE ST. CLAIR, DETROIT RIVER, LAKE ERIE, SOUTHEASTERN MICHIGA
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C
W76-05427

WATER RESOURCES OF THE MISSI AND SAUK RIVERS WATERSHED, CE MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C
W76-05428

WATER RESOURCES OF THE HURON BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Grayling, Mich.
For primary bibliographic entry see Field 7C
W76-05429

DISTRIBUTION OF DIFFERENT QUA OF UNDERGROUND WATERS IN R TEHSIL OF HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 3
W76-05432

IDENTIFICATION OF GAMMA-VALER TONE IN WASTE WATER FROM A SHALE IN SITU RETORT,
Bureau of Mines, Laramie, Wyo. Laramie Research Center.
F. R. McDonald.
Report of Investigations 7918, 1974. 10 p, tab, 10 ref.

Descriptors: *Oil shales, *Geochemistry, *Analytical techniques, *Wyoming, Gas chromatography, Infrared radiation, Nuclear magnetic resonance, Mass spectrometry, Molecular structure, *Pollutant identification.
Identifiers: *Valerolactone, *Oil-shale retorts, Laramie(Wyo), Green River.

Waste water recovered from the retorting of oil shale in Laramie, Wyoming, contained dissolved process materials. These were analyzed to see what materials were present in order to determine if there were any useful components which could be economically recover ed. The compound gamma-valerolactone (valeric acid, 4-hydroxy-gamma-lactone) was identified in an acid fraction subjected to countercurrent extraction and separated by gas chromatography. Because of the small quantities of material present, infrared spectroscopy, nuclear magnetic resonance, and mass spectrometry were used to identify the isolated material. The combined spectral information indicated the presence of a molecule containing carbon, hydrogen, and oxygen with a molecular weight of 100. Infrared spectra indicated a saturated cyclic-type structure with at least one carbonyl-type function in a position indicative of a lactone having a five membered ring, no unsaturation, and no long chains. Mass spectral data indicated one double bond, one ring, and five carbons. The empirical formula was corroborated by nuclear magnetic resonance area resonances. Its detection and identification could be significant in geochemical studies of the origin of Green River oil shale. (Buchanan-Davidson--Wisconsin).
W76-05448

ANALYSIS OF SULFUR-CONTAINING PRODUCTS ACCUMULATED BY CHLORELLA MUTANTS,
Leningrad State Univ. (USSR). Inst. of Nuclear Physics.
For primary bibliographic entry see Field 5C.
W76-05476

5B. Sources Of Pollution

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 1,
Princeton Univ., N. J. Dept. of Geological and Geophysical Sciences.
G. F. Pinder.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 127, $4.50 in paper copy, $2.25 in microfiche. Water Resources Program, Report WRP-75-2, 1975. 50 p. OWRT C-5224(No. 4214)(2).

Descriptors: *Simulation analysis, Aquifers, Model studies, *Groundwater movement, *Mathematical models, *Saline water intrusion, Water quality, Saline water-freshwater interfaces, *Finite element analysis, *Computer models, Systems analysis, Numerical analysis, Equations, Mathematical studies, Coastal plains, *Florida, Mass transfer, *Computer programs.
Identifiers: Cutler area(Fla), Aquifer models, Transport phenomena, *Coastal aquifers.

A set of non-linear partial differential equations which describe the movement of the saltwater front in a coastal aquifer is solved by the Galerkin-finite element method. Pressure and velocities are obtained simultaneously in order to guarantee continuity of velocities between elements. A layered aquifer is modeled either with a functional representation of permeability or by a constant value of permeability over each element. The Galerkin-finite element method is subsequently used to simulate the two-dimensional movement of the saltwater front in the Cutler area of the Biscayne aquifer near Miami, Florida. The concentration distributions for steady state and transient conditions are obtained using pressure and data measured in the field formulating boundary conditions. (See also W76-05011)
W76-05010

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 2,
Princeton Univ., N. J. Dept of Geophysical Sciences.
G. Segol, G. F. Pinder, and W. G. Gray.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 128 $7.75 in paper copy, $2.25 in microfiche copy. Water Resources Program, Report WRP-75-2, 1975. 119 p. OWRT C-5224(No. 4214)(2).

Descriptors: *Simulation analysis, Aquifers, Model studies, *Groundwater movement, *Mathematical models, *Saline water intrusion, Water quality, Saline water-freshwater interfaces, *Finite element analysis, *Computer models, Systems analysis, Numerical analysis, Equations, Mathematical studies, Coastal plains, *Florida, Mass transfer, *Computer programs.
Identifiers: Cutler area(Fla), Aquifer models, Transport phenomena, *Coastal aquifers.

The computer program developed is intended to solve the two-dimensional equations of groundwater flow and mass transport using the Galekinfinite element method. While the program was developed to investigate saltwater intrusion in coastal aquifers by considering a cross-section of the three-dimensional space, it can also be applied by considering a cross-section of the three-dimensional space, it can also be applied to the study of areal problems. The computer code is written in FORTRAN IV for the IBM 360/91 system. The method of analysis is briefly described; and related documentation, such as FORTRAN program listings, are included. (See also W76-05010)
W76-05011

SENSITIVITY OF VERTEBRATE EMBRYOS TO HEAVY METALS AS A CRITERION OF WATER QUALITY, PHASE III, USE OF FISH AND AMPHIBIAN EGGS AND EMBRYOS AS BIOINDICATOR ORGANISMS FOR EVALUATING WATER QUALITY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5C.
W76-05014

PHYSICOCHEMICAL TRANSFORMATIONS OF SEWAGE EFFLUENT RELEASES IN AN EPHEMERAL STREAM CHANNEL,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5A.
W76-05018

PHOSPHORUS MOVEMENT IN SOILS: THEORETICAL ASPECTS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
L. T. Novak, D. C. Adraino, G. A. Coulman, and D. B. Shah.
Journal of Environmental Quality, Vol. 4, No. 1, p 93-99, January/March, 1975. 4 fig, 5 tab, 15 ref, append.

Descriptors: *Phosphorus, *Soil water movement, *Soils, Flows, Waste water treatment, Mathematical models, Adsorption, Unsteady flow, Steady flow, Saturated flow, Unsaturated flow, Water pollution control, *Path of pollutants, Water pollution sources.
Identifiers: Desorption, Steady flow phosphorus models, Transport models, Plug flow, Nonideal flow.

Phosphorus has been identified as one of the nutrients that causes eutrophication in lakes and streams. Land treatment is being considered as a method of removing P and other nutrients from waste waters. A model of P movement in soils is discussed and compared with existing transport models, developed to describe chromatographic and ion exchange processes. The background of transport models is presented. The model described in this study is an adsorption-desorption model which can handle unsteady state flow under unsaturated and saturated flow conditions. The steady flow P model was developed for the following conditions: one-dimensional system in the direction of flow; isothermal system; constant water content, bulk dry solid density and pore velocity; and nonideal flow described by a dispersion coefficient. The model equations are presented. Numerical solutions for the P model were obtained by an implicit numerical technique. Comparisons of various adsorption-desorption models under both plug flow and nonideal flow are graphically illustrated. Application of the P model to describe adsorption in soils results in a shock layer which was less than four centimeters in thickness in all cases considered. If the ratio of the adsorption rate to bulk convective transport rate is large, small shock layers result. The converse is also true. No mathematical theory has been developed to prove that desorption causes a shock layer. Numerical solutions are necessary. (Pinto-FIRL)
W76-05048

POTABLE WATER QUALITY IN RURAL GEORGETOWN COUNTY,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-05050

SEASONAL OCCURRENCE AND DISTRIBUTION OF MICROBIAL INDICATORS AND PATHOGENS IN THE RHODE RIVER OF CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
J. F. Carney, C. E. Carty, and R. R. Colwell.
Applied Microbiology, Vol. 30, No. 5, p 771-780, November, 1975. 3 fig, 6 tab, 19 ref.

Descriptors: Indicators, *Microorganisms, *Pathogenic bacteria, *Bacteria, *Coliforms, Streptococcus, Pollutant identification, Estuaries, Chesapeake Bay, Clostridium, Salmonella, Maryland, *Bioindicators, Path of pollutants, Distribution patterns.
Identifiers: Fecal coliforms, Fecal streptococci, Rhode River estuary (Md), Clostridium botulinum, V. parahaemolyticus.

Coliforms and fecal streptococci have been used as indicators of other pathogenic bacteria associated with fecal contamination. Increasingly heavy nutrient loads have protected microorganisms that would normally die off. Indicator organisms were evaluated as part of a larger study of the microbial ecology of the Rhode River, a small subestuary area of Chesapeake Bay. Four sampling sites were set up at various places in the estuary. Water samples were collected all year at one meter depths, and analyzed for conductivity, salinity, temperature, dissolved oxygen, and turbidity. Water samples were plated on estuarine salt-water-yeast extract agar, and incubated for 2 weeks at 15C. Standard methods of analysis were used to determine total coliform, fecal coliform, and fecal streptococci counts. Clostridium botulinum, Salmonella spp., and V. parahaemolyticus were also measured. Resultsshow that the highest frequency of occurrence of total and fecal coliforms and fecal streptococci was in Muddy Creek, a marsh area which receives most of its runoff from pasture lands. The second highest frequency of occurrence was found in Cadle Creek, which is near populated land. Lowest measurements of these organisms were obtained in the central portion of the Rhode River. Clostridium botulinum was found in about 12% of the samples. Salmonella spp. was not found in any of the samples. V. parahaemolyticus was found near populated areas in the summer months. (Pinto-FIRL)

W76-05052

INVESTIGATIONS ON THE MICROBIAL REDUCTION OF SULPHATES,
Adam Mickiewicz Univ., Poznzn (Poland). Inst. of Geography.
For primary bibliographic entry see Field 5D.
W76-05054

CRITERIA FOR THE ECOLOGICAL EVALUATION OF THE LOWER MAIN RIVER, (IN GERMAN),
Natur-Museum und Forschungs-Institut Senchkenber, Frankfurt am Main (West Germany).
W. Tobias.
Cour Forschungsinst Senckenb. 11. 1-136. 1974.

Descriptors: *Ecology, Evaluation, *Balance of nature, *Chemical wastes, Domestic wastes, *Industrial wastes, Cooling water, Thermal pollution, Water pollution sources, Aquatic life.
Identifiers: *Main River(Germany).

The Lower River Main crosses one of the most overcrowded regions of southwestern Germany. With the centralization of population and industries on its banks, the river has assumed the function of a sewage system for industrial and communal waste waters and for warmed cooling waters from power stations. The ecological balance in the River Main is greatly disturbed. The Lower River Main has 3 ecological regions: the relatively ecological stable section from Wallstadt to Aschaffenburg, the part down to Offenbach, which is extremely sensitive in its ecological balance and a 3rd section from Frankfurt to the River Rhein which has such an excess of chemical content that the macrofauna is threatened.--Copyright 1975, Biological Abstracts, Inc.
W76-05057

UNSATURATED FLOW DURING SOIL TREATMENT OF SEPTIC TANK EFFLUENT,
Soil Survey Inst., Wageningen. (Netherlands)
J. Bouma.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 101, No. EE6, p 967-983, December, 1975. 2 fig, 2 tab. 41 ref. 2 app.

Descriptors: *Soil treatment, *Septic tanks, *Effluents, On-site tests, *Pathogenic bacteria, Hydraulic conductivity, Hydraulic gradient, Hydraulics, Flow, *Waste water disposal, Disposal, Liquid wastes, Domestic wastes, *Unsaturated flow, Waste disposal, *Path of pollutants, Water pollution sources.
Identifiers: Pathogenic purification, Hydraulic head.

The physical theory of unsaturated flow associated with liquid movemet through barriers is examined and some practical implications are studied. Tensiometric in-situ measurements made in soil surrounding operating seepage systems in a wide range of soils are presented and examined. Implications following from the availability of such data for design procedures of waste disposal systems are examined. Subsurface soil disposal of household liquid wastes involves processes of unsaturated flow and the potential of different soils for on-site disposal, and can be described only if hydraulic head curves are available. The effects of soil clogging or soil compaction on infiltration into seepage are a function of the barrier resistance and capillary properties of the soil. To adequately purify septic tank effluent, unsaturated flow is necessary. Data indicate that three feet of soil are required to achieve pathogenic purification, providing the soil is not overloaded. The effluent must be evenly distributed over the seepage area during each application to achieve adequate purification in unclogged sands, and to avoid clogging in weak loamy soils. Construction of shallow trench seepage systems in clayey soil is recommended to avoid compaction and puddling of infiltrative surfaces. Large undisturbed soil columns must be used for laboratory studies to be useful. Columns of improper length filled with sieved aggregates have different hydraulic characteristics. Elaborate on-site testing can be reduced by using classification schemes and soil maps. (Pinto-FIRL)
W76-05058

FACTORS AFFECTING RESPIRATORY QUOTIENT--APPLICATION TO PURE OXYGEN SYSTEMS,
Manhattan Coll., Bronx, N. Y. Dept. of Environmental Engineering and Science.
For primary bibliographic entry see Field 5D.
W76-05078

A DISCUSSION OF A NEAR FIELD DISPERSION MODEL FOR SLUDGE DISCHARGES TO COASTAL WATERS,
Pacific Northwest Environmental Research Lab., Corvallis Oreg.
W. F. Rittall.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, New Brunswick, New Jersey, Rutgers University, p 435-476. 21 fig, 6 tab, 6 ref.

Descriptors: *Dispersion, *Mathematical models, *Sludge, *Sludge disposal, *Computer models, Computer programs, Sewage sludge, Sewage, Federal government, Regulations, Disposal, Ocean, Evaluation, Permits, Analysis, Dispersion, Model studies, Path of pollutants.
Identifiers: *Coastal waters, Computer simulation, Ocean disposal, Transport modes.

Computer simulation techniques can provide a detailed description of the sequence of events that occur after sludge discharge, enhancing the interpretation of physical mechanisms. The application of this simulation technique for the problem of sewage sludge discharges is demonstrated. The depth of penetration of the waste cloud, the dilution, and the depositional characteristics of settleable and floating solids are discussed and related to pertinent Federal Regulations governing ocean dumping. Three separate methods of discharge are described by the model: instantaneous, pumped and wake releases. One liquid and a maximum of eight distinct solid or particulate phases can be chosen from to characterize the waste. Three transport modes are long term diffusion, collapse, and convective descent. Results were evaluated in terms of predictive capabilities and applications to the general problem of permit evaluation, site monitoring surveys, and compliance with regulatory criteria. It is hoped that this model can be of significant value since there is no other procedure or model available to the regulatory programs which provides such a detailed degree of analysis. (See also W76-05079) (Pinto-FIRL)
W76-05089

RATES AND MECHANISMS OF CHEMICAL REACTIONS DURING FLOW OF SECONDARY TREATED SEWAGE EFFLUENT THROUGH POROUS BEDS,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 5D.
W76-05103

THE ENERGY FLOW THROUGH A LOTIC ECOSYSTEM, (IN SWEDISH),
Umea Univ. (Sweden). Dept. of Biology; and Umea Univ. (Sweden). Dept. of Ecological Zoology.
U. Karlstrom.
Zool Revy. 35(3): 109-114. 1973.

Descriptors: *Ecosystems, *Lotic environment, Energy, *Food chains, Detritus, Flow, *Flow regulation, Phytoplankton, Zooplankton, Reviews.
Identifiers: *Energy flow.

Structure and function of a lotic ecosystem are discussed, with emphasis on the detritus food chain. The ecosystem can be described in the following terms: driving forces, components or structure, energy flow and regulating mechanisms of the flow. The different conditions of a brook and a river and their ecological impact on the phyto- and zoo-communities are discussed. A short review of literature concerning the 1st works on ecosystem studies and energy flows is given.--Copyright 1975, Biological Abstracts, Inc.
W76-05124

CORROSION IN DISPOSAL WELLS,
Subsurface Disposal Corp., Houston, Tex.
For primary bibliographic entry see Field 5E.
W76-05125

EXPANSION OF SALT-WATER ZONE DUE TO WELL DISCHARGE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-05133

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME I.
National Research Council, Washington, D.C. Ocean Affairs Board.
Workshop held May 21-25, 1973, Airlie, Virginia. May 1973. 374 p. NSF N00014-67-A-0244-0028.

Descriptors: *Path of pollutants, *Oceans, *Water pollution sources, *Conferences, *Oil, Oil spills, Oil pollution, Oily water, Oil wastes, Analytical techniques, Chemical analysis, Measurement, Pollutant identification, Biodegradation, Environment, Environmental effects, Aquatic environment, Water pollution effects, Bioindicators, Water analysis.

Subject areas covered in background papers included: (1) input sources of petroleum to the marine environment; (2) chemical techniques for identification of waterborne oil, determination of trace concentrations of petroleum-derived pollutants in the ocean, determination of petroleum contamination in marine organisms, and analysis of the environmental impact of an offshore oil spill; and (3) biological techniques for studying effects of marine oil spills, evaluation of biological damage, and hydrocarbon biodegradation kinetics. (See W76-05136 thru W76-05153) (Humphreys-ISWS)
W76-05135

THE SOURCES OF OIL ENTERING THE SEA,
British Petroleum Trading, Ltd., London (England).
K. G. Brummage.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board, Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D. C., p 1-6, May 1973. 11 ref.

Descriptors: *Oil pollution, *Oil wastes, *Water pollution sources, Ships, Accidents, Oil spills, Oily water, Water pollution, Oil industry, Oil Fuels, Effluents, Path of pollutants.

The main sources of oil entering the sea were reviewed. These sources included tanker cargo operations, tanker accidents, accidents of other ships, offshore oil operations, refineries discharges on land, and bilges, bunkering, etc. The total amount of oil entering the sea was estimated to be 2.55 million tons per annum. About 39% of this is due to tanker operations. (See also W76-05135) (Sims - ISWS)
W76-05136

**ANTITATIVE ESTIMATES OF PETROLE-
I TO THE OCEANS**
ast Guard, Washington, D. C.
B. Charter, R. A. Sutherland, and J. D.
ricelli.
Background Papers for a Workshop on Inputs,
es, and Effects of Petroleum in the Marine En-
onment, Volume I; Ocean Affairs Board
rkshop held May 21-25, 1973, Airlie, Virginia.
ional Academy of Sciences, Washington, D.
p 6a-30, May 1973. 1 fig, 7 tab, 7 ref.

criptors: *Oil pollution, *Oceans, *Water pol-
on sources, Oil wastes, Oil spills, Oily water,
s, Accidents, Oil industry, Oil, Estimating,
er pollution, Path of pollutants.

need for an overall view of oil pollution of the
has led to a number of estimates of the annual
unt of oil discharged into the marine environ-
t. These estimates surprisingly do not differ
one another in the overall totals given,
ough the contribution attributed to various
ces within that total differs widely. Some con-
itions are known with a fair degree of accura-
others can only be said to represent a 'best
nate' . The estimates of ten of the more impor-
sources of information on this topic were
lated. The sources of oil were broken down
four major categories: (1) tank cleaning and
sting operations by tankers, (2) other tanker
other vessel operations including terminal
ations, (3) ship accidents, and (4) non-ship
ces. The total for these sources is estimated to
bout 3.5 million metric tons per annum. (See
W76-05135) (Sims - ISWS)
-05137

**T OF PETROLEUM TO THE MARINE EN-
ONMENT DIRECTLY FROM THE AT-
PHERE,**
neering-Science, Inc., Berkeley, Calif.
Feuerstein.
ackground Papers for a Workshop on Inputs,
, and Effects of Petroleum in the Marine En-
ment, Volume 1; Ocean Affairs Board
shop held May 21-25, 1973, Airlie, Virginia.
nal Academy of Sciences, Washington, D.
30a-38, May 1973. 2 tab, 9 ref.

riptors: *Oil pollution, Organic compounds,
astes, Water pollution, *Path of pollutants,
r pollution sources, Oil, Transportation,
all, Precipitation(Atmospheric).

category 'hydrocarbons' is not limited to
leum or petroleum-derived products but con-
many other carbon-and hydrogen-containing
ounds. For the purpose of this discussion,
hydrocarbons' emanatingfrom the following
es are considered as 'petroleum': transporta-
combustion of fuel oil from stationary
es, industrial processes, organic solvent
ration and gasoline marketing. These
es amount for a total of 23.6 million metric
er annum or 81% of the total hydrocarbon
on to the atmosphere from the United
. Total worldwide emission of petroleum
carbons is estimated to be 68 million metric
er annum, of which transportation com-
approximately two-thirds. The total amount
roleum hydrocarbons reaching the oceans
atmosphere is estimated to be approximate-
o 0.8 million metric tons per annum as com-
to 2 to 3 million metric tons per annum from
sources such as tanker operations, ac-
l spills, terminal and transfer operations,
re oil production and so forth (See also
5135) (Sims-ISWS)
5138

**EY OF PRESENT KNOWLEDGE AND
SSION OF INPUT OF PETROLEUM TO
ARINE ENVIRONMENT IN SWEDEN,**
h Water and Air Pollution Research Lab.,
rg (Sweden).
hagen.

In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume 1; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D. C., p 38a-49, May 1973. 6 tab, 4 ref.

Descriptors: *Oil wastes, *Oil pollution, *Oceans, *Water pollution sources, Oil, Oil spills, Transportation, *Path of pollutants, Chemical analysis, Organic compounds, Atmosphere, Precipitation(Atmospheric), Water pollution.
Identifiers: *Sweden.

In Sweden roughly 30.5 million cu m of petroleum products was consumed during 1972, corresponding to 3.75 cu m/person. Since Sweden has no petroleum wells within its borderlines all consumption is based upon imports. It was calculated, through comparison between delivered and consumed quantities, etc., that the total loss, spill and evaporation of petroleum products in Sweden, except unburned hydrocarbons in the exhaust gases from burning processes, amount to roughly 0.5 - 0.7% of the total consumption, or 150,000 - 200,000 cu m/year. In addition to this, major amounts of hydrocarbons reach the atmosphere from all kinds of burning processes. This quantity was estimated to be somewhere around 300,000 cu m/year. A satisfactory explanation to how much of Sweden's estimated loss of petroleum products gains access to the environment cannot be given at present. Roughly 25% of the total estimated loss, except unburned hydrocarbons, could be considered fairly well traced. Possible explanations to the remaining part would be: (1) evaporation to atmosphere of hydrocarbons from other sources than refineries, and (2) oil spill collected in industry and elsewhere being burned as fuel oil. (See also W76-05135) (Sims - ISWS)
W76-05139

PETROLEUM INPUTS TO THE MARINE ENVIRONMENT FROM LAND SOURCES,
Engineering-Science, Inc., Berkeley, Calif
P. N. Storrs.
In: Background Papers for Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D. C., p 49a-58, May 1973. 2 tab, 9 ref.

Descriptors: *Oil wastes, *Oil pollution, *Oceans, Water pollution, *Water pollution sources, *Path of pollutants, Oil, Domestic wastes, Industrial wastes, Land, Estimating, Oil industry, Urban runoff, Urban drainage.

Relatively little attention has been given to the inputs of petroleum based materials from land sources. This paper is concerned with estimating the quantities of petroleum materials entering the coastal waters from municipal and industrial wastewaters, urban storm drainage, and surface water discharges. One of the problems encountered immediately are facts that almost none of the data in the literature concerning the characterization of waters and wastewaters has been collected with the objective of measuring petroleum. In standard sanitary engineering practice, measurements of a lumped parameter, oil and grease, are routinely made of waters and wastewaters. The total municipal input of petroleum to the ocean may be estimated by assuming a unit input of 8 g/cap-day and 68 million persons living in coastal areas to obtain a nationwide estimate of about 200,000 metric tons per year. The major industrial input of petroleum is from refineries and oil production facilities. Assuming a total United States refinery capacity of 5 x 10 to the 9th power bbls/yr, and a unit mass emission rate of 5 metric tons/million bbls, the total national input from refineries would be about 25,000 metric tons/yr. Again assuming that the world production capacity is about 2 x 10 to the 9th power metric tons or about 15 x 10 to the 9th power bbls/yr, one would obtain a worldwide total of 75,000 metric tons/yr from refineries. (See also W76-05135) (Sims - ISWS)
W76-05140

ESTIMATE OF ANNUAL INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT FROM NATURAL MARINE SEEPAGE,
Exxon Production Research Co., Houston, Tex. Geologic Research.
R. D. Wilson.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 58a-96, May 1973. 6 fig, 8 tab, 24 ref.

Descriptors: *Seepage, *Oil, *Oceans, *Oil pollution, Path of pollutants, Water pollution, Water pollution sources, Oil wastes, Geology, *Estimating, Faults(Geologic), Earthquakes.
Identifiers: *Marine oil seepage.

A portion of the oil now present in the world's ocean results from the direct discharge of submarine seeps into the water. Although only a very few marine oil seeps are presently known and located, all evidence suggests that with further investigation, many more will be found. Few seepage flow rate observations are available either for offshore or onshore seeps. In view of the limited observations, only a few cursory estimates of total worldwide annual marine seepage have been made; there appears to be no substantiation for any of these estimates. This paper, which is based on geologic considerations, presented an estimate of yearly oil input into the oceans from naturally occurring marine seepage. The probable range of seepage into the marine environment is 0.2 to 6.0 million metric tons per year. Within this range the best estimate for present marine seepage worldwide is 0.6 million metric tons per year. This is based on the presumption that only a few other areas around the world are as seepage-prone as Southern California. Measurements of seeps and seepage rates are too few to allow an accurate estimation by observation and measurement techniques alone. Seepage potential can, however, be related to geologic criteria, and these provide sound bases for marine seepage assessme nt. (See also W76-05135) (Sims-ISW)
W76-05141

ESTIMATES OF ANNUAL INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT FROM OFFSHORE PRODUCTION OPERATIONS,
Exxon Production Research Co., Houston, Tex. Geologic Research.
R. D. Wilson.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 96a-110, May 1973. 3 tab, 6 ref, 1 append.

Descriptors: *Oil spills, *Oil pollution, *Oil wells, *Oceans, *Gulf of Mexico, *Offshore platforms, Water pollution, Water pollution sources, Oil industry, Accidents, Pollutants, Path of pollutants, Brines, Oil fields, *Estimating.

It is estimated that the amount of oil entering the sea from minor spills and produced brines during the normal drilling and operation of offshore oil and gas wells worldwide is 0.02 million metric tons per year. In addition, losses due to major accidents are not expected to exceed the average loss experience of recent years. Extrapolating the available data from United States operations in the Gulf of Mexico from 1964-1971 suggests that loss to the sea from major accidents wells or production facilities might reach 0.06 million metric tons per year. Thus, total input of oil to the sea from

offshore drilling and production operations is estimated at 0.08 million metric tons per year worldwide. (See also W76-05135) (Sims - ISWS)
W76-05142

EUROPEAN EXPERIENCE IN THE IDENTIFICATION OF WATERBORNE OIL,
Shell Research Ltd, Chester (England). Thornton Research Center.
For primary bibliographic entry see Field 5A.
W76-05143

MEASUREMENT OF HYDROCARBONS IN WATER AND SEDIMENT,
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
For primary bibliographic entry see Field 5A.
W76-05144

METHODS FOR POLYNUCLEAR AROMATIC
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
For primary bibliographic entry see Field 5A.
W76-05145

THE QUANTITATIVE DETERMINATION OF TRACE CONCENTRATIONS OF PETROLEUM-DERIVED POLLUTANTS IN THE OCEAN,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W76-05147

THE ENVIRONMENTAL IMPACT OF AN OFFSHORE OIL SPILL,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5C.
W76-05148

PARTITIONING OF HYDROCARBONS BETWEEN THE ATMOSPHERE AND NATURAL WATERS,
Chevron Oil Field Research Co., La Habra, Calif.
C. D. McAuliffe.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 279a-290, May 1973. 1 tab, 15 ref.

Descriptors: *Oil pollution, *Oceans, *Evaporation, Oily water, Water pollution, Atmosphere, Surface waters, Air, Oil, Oil spills, Chemistry, Methane, *Path of pollutants.

When oil is discharged onto a water surface, the lower-molecular-weight hydrocarbons with up to at least 12 to 15 carbon atoms in the molecule evaporate into the atmosphere. Atmospheric loss of individual hydrocarbons becomes proportionately less as their molecular weight increases or water temperatures decrease. The amount of evaporative loss depends also upon the type of oil. Portions of the lower-moleculor-weight hydrocarbons also dissolve in waters. Following solution in water, most of the dissolved hydrocarbons probably partition into the atmosphere rather quickly under wind, current, and wave action. It has been postulated that up to 90 million tons of volatile petroleum hydrocarbons, chiefly from land sources, are added to the atmosphere each year. This paper discussed the predicted distribution of hydrocarbons between the atmosphere and waters, the relative volume of the atmosphere and the oceans, and the observed partitioning of methane between the atmosphere and oceans. (See also W76-05135) (Sims-ISWS)
W76-05149

IDENTIFICATION OF WATERBORNE OILS,
Shell Development Co., Houston, Tex. Bellaire Research Center.
For primary bibliographic entry see Field 5A.
W76-05150

HYDROCARBON BIODEGRADATION KINETICS,
Alaska Univ., College. Inst. of Marine Science.
D. Button.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 306a-322, May 1973.

Descriptors: *Oil spills, *Biodegradation, *Metabolism, *Oceans, Path of pollutants, Microbial degradation, Oil pollution, Degradation(Decomposition), Aquatic microbiology, Microbiology, Marine microorganisms, Bacteria, Fungi, Laboratory tests, On-site investigations.

Microbial metabolism, eventually to carbon dioxide, is the final fate of spilled oil except for portions somehow preserved. Response in water chemistry to oil spilled can be considered as the result of a single impulse and subsequent relaxation back to the original equilibrium. Catalysts setting the rate and extent of the reactions are enzymes. Taken collectively this is the population of hydrocarbon oxidizing organisms, chiefly bacteria and fungi. It is these populations that would directly respond to spilled oil. Decay rates, along with the reciprocal changes in heterotrophic populations, depend on a number of largely unmeasured rate constants. However limited observations of in situ radioactive hydrocarbon oxidation rates suggest that hydrocarbon oxidation occurs with rather surprising speed in the marine environment. (See also W76-05135) (Sims-ISWS)
W76-05151

METHODS FOR STUDYING THE EFFECTS OF MARINE OIL SPILLS,
Woods Hole Oceanographic Inst. Mass.
For primary bibliographic entry see Field 5C.
W76-05152

ANALYTICAL APPROACH IN THE EVALUATION OF BIOLOGICAL DAMAGE RESULTING FROM SPILLED OIL,
Consortium of Universities for Water Research, Montreal (Quebec).
For primary bibliographic entry see Field 5C.
W76-05153

MATHEMATICAL MODELS PREDICT CONCENTRATION-TIME PROFILES RESULTING FROM CHEMICAL SPILL IN A RIVER,
Dow Chemical U. S. A., Midland, Mich. Health and Environmental Research.
W. B. Neely, G. E. Blau, and T. Alfrey, Jr.
Environmental Science and Technology, Vol. 10, No. 1, p 72-76, January 1976. 8 fig, 2 tab, 6 ref.

Descriptors: *Mathematical models, *Flow rates, *Evaporation, *Solubility, Water pollution effects, *Path of pollutants, *Mississippi River, Density, Dispersion, River flow, Hydraulics, Mixing.
Identifiers: Infusion, Concentration time, River geometry.

With the increased use of the nation's waterways for the transportation of materials, there is an increase in the probability of spills. Once such a spill has occurred, there is an immediate need to predict the concentration profile of the chemical as the spill travels in order to assess the impact to both humans and the environment. This paper discussed the use of a mathematical model that has this predictive capability for common spills. Although the model was derived from the assumption that the chemicals are completely water soluble, it is also useful for partially soluble materials. The credibility of the model was demonstrated by comparing the concentration profile predicted with the actual profiles measured in two different incidents. The model fit the data adequately and provided a plausable explanation of chloroform spill in the Mississippi River. It demonstrates how the soluble contaminant concepts can be modified via an interactive model-building procedure to arrive at a model suitable for describing a contaminant with different physiochemical properties. (Lardner-ISWS)
W76-05155

COMPARISON OF THERMAL SCANNING AN IN SITU TECHNIQUES FOR MONITORIN THERMAL DISCHARGES,
Argonne National Lab., Ill.
G. J. Marmer, J. V. Tokar, and R. P. Madding.
Water Resources Bulletin, Vol. 11, No. 6, p 115 1180, December 1975. 15 fig, 3 ref.

Descriptors: *Remote sensing, *Infrared radi tion, *Thermal pollution, *Heated water, *Path pollutants, Nuclear powerplants, Great Lake *Lake Michigan, *Isotherms, Aircraft, Temper ture, Water cooling, Water pollution source Water temperature, Lakes.
Identifiers: *Thermal plumes, Infrared scannin Point Beach nuclear power plant(Wis), Isotherm configurations, Centerline temperature decay.

Two methods of measuring the behavior of th mal plumes were compared by application plumes at Point Beach Nuclear Power Plant Lake Michigan. The classical in situ metho which employs surface and subsurface thermist probes extended from a boat whose position determined by a microwave ranging system, w contrasted with a remote sensing technique wh utilizes an aircraft-mounted infrared scan operating in the 8-14 micron range. Princi characteristics of plume description were isoth mal configurations, areas contained wit isotherms, and centerline temperature decay. T in situ method was slow and subject to effects external forces over the test period, and it requi interpolative judgment to generate isotherms; it did provide information on subsurface as wel surface temperatures. Thermal scanning produc a considerably more detailed picture of surf temperature, but it was subject to distortion surface skin effects during extremely calm con tions. Good agreement between the methods found in four of five occasions; the fifth insta was a case of quiescent conditions distorting results of thermal scanning. It was proposed the methods be used jointly to achieve the b possible picture of thermal plume behav (Bender-ISWS)
W76-05156

LONGITUDINAL DISPERSION IN NATUR CHANNELS,
Geological Survey of Canada, Ottawa (Ontario
T. J. Day.
Water Resources Research, Vol. 11, No. 6, p 918, December 1975. 11 fig, 5 tab, 31 ref.

Descriptors: *Dispersion, *Channel flow, Nat flow, *Tracers, *Mixing, Flow, Flow prof *Path of pollutants, Convection, Movem Water pollution, Channels, On-site investigatio
Identifiers: *Taylor's analysis, *Dispersion co cient, *New Zealand.

The longitudinal dispersion of fluid particle natural channels was investigated in an exten series of experiments in small mountain stre (New Zealand). These experiments extended a maximum distance of 2,250 m, a mean velo range of 0.32-1.57 m/s, and a mean flow w range of 2.7-21.8 m. It was conclusively shown these channels and others as well that the sp

standard deviation of an initially concentrated
s increases linearly with distance and not as its
are root, as is necessary for the application of
lor's mixing model. One consequence of the
arity is an ever-increasing dispersion coeffi-
t along the channel. It was also shown that the
-concentration curve of a dispersing tracer
s maintains a persistent asymmetry. This per-
nt asymmetry and the continued linear
ading appeared to be characteristic of disper-
in natural channels and as such showed the in-
quacies of applying Taylor's analysis. (Bender-
S)
-05160

CONCENTRATION AND BIOTRANSFER
AFLATOXIN,
rado State Univ., Fort Collins. Dept. of
obiology.
. Nevins, and D. W. Grant.
etin of Environmental Contamination and
cology, Vol. 6, No. 6, p. 552-558,
ember/December, 1971. 17 ref.

riptors: *Farm wastes, *Microorganisms,
icity, *Feed lots, Cattle, Fish, Isolation, Path
llutants, Food chains.
ifiers: *Bioconcentration, *Biotransfer,
toxin, Substrate, Flies, Aspergillus flavus.

arch was undertaken to isolate aflatoxin-
icing strains of Aspergillus flavus from
re and to demonstrate a potential path for the
nsfer and biomagnification of the aflatoxins
mulated food chain. Toxigenic strains of A.
s can be readily recovered from stockpiled
ot manure. Under certain conditions, aflatox-
oduction within the manure can occur. Since
anure is attractive to several species of
siting flies, notably Musca domestica, ample
tunity exists for the biotransfer of the
xin from the manure into the insect larvae.
ots can convert the manure substrate into
biomass with an efficiency of 71 percent,
which the toxicity of the substrate increases.
this maggot-bioconcentrated crude aflatoxin
ngested by trout, severe aflatoxicosis was
t in the fish within 10 days. Although trout
have little access to toxic maggots, the fish
receive carcinogenic doses via ingestion of
es developed from toxic larvae. It appears
rious environmental health problems could
p from the biotransfer and bioconcentration
toxins originating in stockpiled manure. The
m is probably most prevalent in agricultural
with favorable high temperatures and hu-
s. (East Central)
5169

L IMPLICATIONS OF FEEDLOT POLLU-
N NEBRASKA,
ska Univ., Lincoln. Coll. of Agriculture and
Economics.
mary bibliographic entry see Field 5G.
5173

TION EFFECTS ON SURFACE AND
ND WATERS, (LITERATURE REVIEW),
Univ., Honolulu. Dept. of Civil Engineer-
Young.
Water Pollution Control Federation, Vol.
6, p. 1419-1429, June, 1974. 103 ref.

tors: *Water pollution sources,
nts, *Heavy metals, Chemicals, Runoff,
vs, *Bibliographies, *Farm wastes,
water, Radioisatapes, Soil contamination,
pollutants.
ers: Biological contamination.

re concerning the pollution effects of vari-
stances on surface and groundwater is
d. Among the substances covered are:
, agricultural wastes, chemicals, heavy metals and radionuclides, and biological contamination. Nutrient enrichment sources cited were sewage treatment effluents, industrial wastes, urban runoff, and agricultural runoff. Documented sources of agricultural pollution were: (1) percolates from surface irrigated dairy manure slurrries, (2) storm runoff from cattle feedlots, (3) runoff from agricultural watersheds, and (4) seepage from wastewater irrigation. Chemical pollution sources were: oil field brine disposal; salt-water intrusion in coastal areas; irrigation-return flow; contaminants from outboard motor fuel; herbicides; use of deicing salts on highways; and the mobilization of the constituents in contaminated snow, such as heavy metals, oils, greases, phenols, and BOD from decaying organic matter. Heavy metal and radionuclide contamination sources were discharges from gold recovery operations, use of nuclear reactors, and nuclear weapons tests. Sources of biological contamination included: (1) slime outbreaks due to industrial or domestic wastewater effluents, (2) coliforms due to discharges from boats and a faulty septic tank, and (3) viruses from septage filtrates. Reclamation by groundwater recharge, soil pollution, and modeling analytical research methods were reviewd. (Penrod-East Central)
W76-05176

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER - PHASE II,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8G.
W76-05180

CAPABILITY OF INTEGER PROGRAMMING ALGORITHMS IN SOLVING WATER RESOURCE PLANNING PROBLEMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6A.
W76-05183

HEAT DISSIPATION FROM TURBULENT OPEN CHANNEL FLOW,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
P. G. Mayer, and M. D. Moss.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 745, $5.00 in paper copy, $2.25 in microfiche. Completion Report ERC-0376, Georgia Environmental Resources Center, Atlanta, January 1976. 79 p, 18 fig, 6 tab, 33 ref. OWRT A-048-GA(2), 14-31-0001-4010.

Descriptors: Path of pollutants, Water pollution control, *Open channel flow, Convection, Evaporation, *Thermal pollution, *Heat transfer, Cooling water, *Turbulent flow, Dispersion, Energy dissipation, Mixing, Turbulence, Dissipation, *Roughness(Hydraulic), Heated water.
Identifiers: Evaporative cooling, Convective mixing, *Heat dissipation.

The purpose was to establish quantitatively the effect of turbulence on heat dissipation in open channels. The study investigated systematically factors which affect heat transfer from open channel flow. Thus, an attempt was made to combine the thermodynamic and hydrodynamic phenomena in order to obtain design parameters. An examination was made of channel roughnesses as a means of additional mixing and hence of additional thermal transfer. The laboratory study showed the quantitative increase in evaporative cooling as a consequence of increased turbulent mixing in open channel flow and suggested artificially roughened channels as an alternate means of accomplishing the rejection of excess industrial heat into the environment. The theoretical study provided a means for the application of the study results to the design of open channels as an alternate means of dissipation of excess industrial heat.
W76-05248

DISTRIBUTION OF NUTRIENTS IN LOUISIANA'S COASTAL WATERS INFLUENCED BY THE MISSISSIPPI RIVER,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
C. L. Ho, and B. B. Barrett.
Technical Bulletin No. 17, August 1975. 39 p 19 fig, 14 tab, 219 ref.

Descriptors: *Path of pollutants, *Chemical wastes, Organic compounds, Inorganic compounds, *Nutrients, Bays, Fisheries, Fishkill, *Industrial wastes, *Nitrogen, *Salinity, *Dissolved oxygen, *Mississippi River, Marshes, Oxygen demand, Water pollution effects, Agricultural chemicals, Gulf of Mexico, Sea water, *Louisiana.
Identifiers: Caminada Bay(La), Barataria Bay(La), Quatre Bayou Pass(La), Southwest Pass(La).

The Mississippi River is the source of a variety of inorganic nutrients and other chemical compounds for the Gulf of Mexico and particularly near shore waters. While these nutrients help form the basis for Louisiana's high fish production, uncontrolled disposal of industrial waste in the River may lead to a deterioration of fishing areas. Plants such as algae and sea lettuce grow uncontrolled when nutrients are available. Their subsequent decay often causes anaerobic conditions resulting in fish kills. To determine actual composition of coastal waters, sampling expeditions were undertaken in 1973, 3 when Mississippi waters were at a high level and once at a time of low flow. Water was taken from Caminada Bay, Barataria Bay, Quatre Bayou Pass, Southwest Pass, and offshore stations in water ranging in depth from less than 1.5 meters to about 12 m. In the shallow bay locations only surface water was collected, but in the deeper offshore areas surface and bottom were sampled because of pronounced water stratification. Analysis was done on shore as soon as possible and though some chemical changes occur when transporting samples it was felt that consistent procedures would give valid comparisons. The River contributes large amounts of NO3-, dissolved Si02, P04-3, and organic-N to the Gulf. Barataria and Caminada Bays are less affected by the River, there being less NO3 and NO2 and more NH4+N than in the near shore waters. During time of low river flow the nearshore waters were dominated by nutrient-depleted seawater. (Slmith-North- Carolina)
W76-05259

COMPARISON OF INORGANIC NITROGEN CONTENTS OF UNDISTURBED, CULTIVATED, AND BARNYARD SOIL PROFILES IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soils.
R. J. Olsen, R. F. Hensler, O. J. Attoe, and S. A. Witzel.
Soil Science Society of America Proceedings, Vol. 34, No. 4, p. 699-700, July-August, 1970. 1 tab, 9 ref.

Descriptors: *Nitrates, *Nitrites, *Soil profiles, *Wisconsin, *Water pollution, *Soils, Path of pollutants, Water pollution sources, *Wisconsin.
Identifiers: Exchangeable ammonium, Ammonia-nitrogen, Nitrate-nitrogen.

The need for adequate disposal of increasing amounts of livestock wastes suggests that pollution of subsurface and surface waters from this source is likely to become of greater importance. Information was obtained on the contents of nitrate and other forms of inorganic nitrogen in soil profiles under various conditions in Wisconsin, particularly from cultivated fields, undisturbed or virgin locations, and from barnyards. The average total content of NO3-N in the

profile was lowest for the undisturbed soils and highest for the cultivated soils. The values for NO2-N were much lower. They were lowest in the well-drained barnyard profiles and highest in the poorly-drained ones. The values for exchangeable NH4-N varied more widely between profiles, were lowest for the cultivated soils and highest for the poorly-drained barnyard soils. The concentration of NO3-N tended to decrease with soil depth, apparently because of denitrification, microbial immobilization processes and plant uptake. The total content of NO2-N to the 240-cm depth ranged from 6 to 25 kg/ha. The results suggest that contamination of the groundwater with NO3-N from animal wastes would mainly concern farm families that consume water from wells located too close to barnyards and feedlots. Excessive rates of applying fertilizer N should be avoided. (Kehl-East Central)
W76-05263

SOURCES OF CONTAMINATION OF ARTESIAN WATERS BY CARCINOGENIC HYDROCARBONS, (IN RUSSIAN),
P. M. Vindyukov, G. L. Sardarova, and K. V. Kutakov.
Gig Sanit. 38(11): 98-99, 1973.

Descriptors: *Water pollution sources, *Artesian wells, *Confined water, Organic compounds, Phenols, Industrial wastes, Oil pollution, Organic wastes, Chemical wastes.
Identifiers: *Carcinogenic hydrocarbons, Carcinogens, *Benzo(a)pyrene.

The content of benzo(a)pyrene in artesian waters in 3 regions differing in hydrologic conditions was studied. The 1st region (control) was characterized by a reliable confining bed above the artesian horizon. The 2nd region had the same hydrologic conditions but as a result of an accident a one-time intense contamination of the artesian horizon (directly through the well) by industrial wastes containing phenol in high concentrations occurred. The 3rd region was characterized by unfavorable hydrologic conditions and presence of petroleum products on the surface which contaminated the artesian horizon for many years. The content of benzo(a)pyrene in artesian waters was related directly to pollution of the water source and especially its pollution by petroleum products. The presence of the carcinogen in the artesian waters of the control point (1st region), which was free from local chemical pollutants on the surface, suggested the presence of nautral background concentrations of benzo(a)pyrene in local subsurface waters.--Copyright 1975, Biological Abstracts, Inc.
W76-05265

DISPERSING OIL FILMS ON WATER.
For primary bibliographic entry see Field 5D.
W76-05281

AGRONIMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES (REPERCUSSIONS AGRONOMIQUES DES EPANDAGES D'EFFLUENTS DES INDUSTRIES AGRICOLES ET ALTIMENTAIRES,
Institut National de la Recherche A Agronomique, Versailles (France). Station Centrale d'Agronomie.
For primary bibliographic entry see Field 5D.
W76-05331

METHOD AND MEANS FOR MONITORING THE QUANTITY OF DISPERSED OIL IN WATER,
For primary bibliographic entry see Field 5A.
W76-05338

PREDICTING ANION MOVEMENT IN DISTURBED AND UNDISTURBED SOILS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-05402

BACTERIAL POLLUTION IN LAKE BURLEY GRIFFIN,
Royal Military Coll., Duntroon (Australia). Dept. of Geography.
For primary bibliographic entry see Field 5C.
W76-05407

TIME-OF-TRAVEL OF SOLUTES IN THE TRINITY RIVER BASIN, TEXAS, SEPTEMBER 1973 AND JULY-AUGUST 1974,
Geological Survey, Fort Worth, Tex.
For primary bibliographic entry see Field 7C.
W76-05426

LEFT BEHIND--SOVIET MINE WASTES,
For primary bibliographic entry see Field 5G.
W76-05437

5C. Effects Of Pollution

SENSITIVITY OF VERTEBRATE EMBRYOS TO HEAVY METALS AS A CRITERION OF WATER QUALITY, PHASE III, USE OF FISH AND AMPHIBIAN EGGS AND EMBRYOS AS BIOINDICATOR ORGANISMS FOR EVALUATING WATER QUALITY,
Kentucky Water Resources Research Inst., Lexington.
W. J. Birge, A. G. Westerman, and J. A. Black.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 404, $4.00 in paper copy, $2.25 in microfiche. Research Report No. 91, January 1975. 31 p, 2 fig, 9 tab, 29 ref. OWRT B-044-KY(1). 14-31-0001-5077.

Descriptors: *Bioassay, *Bioindicators, Heavy metals, Water quality, Water pollution effects, *Kentucky, Mercury, *Fish eggs, Fish populations, *Embryonic growth stage, *Larval growth stage, Frogs, Amphibians, Cultures, Rainbow trout.
Identifiers: *Frog eggs, *Treefrogs, Species diversity.

Fish and amphibial eggs, embryos and early posthatched (larva) stages were evaluated as bioindicator organisms with which to monitor the quality of natural water resources. Eggs of 9 species were cultured in water collected from each of 11 Inner Bluegrass rivers and streams varying in quality from extremely poor to good. Cultures were maintained in vitro, using 12-hr changes of water. Averaging data for all 9 animal species, egg hatchability (embryonic survival) ranged from 0% for the most contaminated water to 94% for uncontaminated water found to support a healthy aquatic biota. Eggs of the squirrel treefrog and gray treefrog were the most sensitive of 5 amphibian species tested, and of 4 fish species, rainbow trout eggs proved most susceptible to water contaminants. Egg development provided an index to water quality which compared favorably with independent ecological indicators. In particular, the frequencies of embryonic mortality recorded for the 11 monitoring sites correlated with reductions in density and species diversity of piscine populations. Selected water sources were analyzed for mercury and other trace metals. Appreciable levels of metallic contaminants were found in those water sources which produced high levels of egg mortality. Egg hatchability was precluded or markedly reduced in all test waters where total mercury reached 0.3 ppb or more.
W76-05014

EFFECTS OF ARTIFICIAL DESTRATIFI TION ON POPULATIONS OF BENTI MACROINVERTEBRATES AND ZOOPLA TON IN HAM'S LAKE AND ARBUC RESERVOIR,
Oklahoma State Univ., Stillwater, School Biological Sciences.
J. Wilhm.
Available from the National Technical Info tion Service, Springfiel,Va 22161, as PB-250 $5.00 in paper copy, $2.25 in microfi Oklahoma Water Resources Research Insti Stillwater, Completion Report, (1976). 92 p, 2 50 tab, 42 ref, append. OWRT A-059-OKLA(1

Descriptors: *Destratification, *Invertebr *Zooplankton, *Benthos, *Oklahoma, Reserv Water temperature, *Dissolved oxygen, Pum Aquatic, animals, Aquatic populations, Wate lution effects.
Identifiers: Arbuckle Reservior (Okla), H Lake(Okla), Species diversity.

Variations with depth of the density and div of benthic macroinvertebrates and zoopla were observed in two Oklahoma reservoir dergoing destratification attempts. Arb Reservoir has about 24 x the surface area, 3 depth, and 78 x the volume of Ham's Lake. perature and dissolved oxygen of the wate lected near the bottom at different depths d the benthic macroinvertebrate sampling in th reservoirs were relatively uniform with de winter. In spring and summer dissolved o progressively became more limiting in d waters. Dissolved oxygen increased in the b waters after pumping began in Ham's Lak smaller reservoir. No change was observed larger reservoir. The assemblage of b macroinvertebrates in other reservoirs ge was composed of a few common species and rare species in the shallow depths and of abundant species in the deeper water. Altho consistent relationship was noted be macroinvertebrate species diversity and de either reservoir, species diversity decrease depth. Density or diversity of zooplankton w consistently related to depth in either reserv did these variables reflect the severe c limitations of deeper waters in summer.
W76-05017

OUTLINE OF FUTURE RESEARCH A TIES AT RICKLEA FIELD STATION SWEDISH),
Umea Univ. (Sweden). Dept. of Ecological gy; and Umea Univ. (Sweden). Dept. of Biol
U. Karlstrom.
Zool Revy. 35(3): 135-138. 1973.

Descriptors: *Sampling, Energy, Rivers, *Secondary productivity, Methodology.
Identifiers: *Ricklea(Sweden), *Energy flo

The research group at Ricklea field (Sweden) has begun work to determine th nitude of the driving forces and to quant ferent components, particularly the sec producers. Due to the obstacle of worki river, the first steps were to elaborate meth quantitative sampling. The slow-flowing p the River Ricklea permit easy sampling, b assumed that the largest portion of ener goes through the rapids.--Copyright 1975, cal Abstracts, Inc.
W76-05046

CRITERIA FOR THE ECOLOGICAL E TION OF THE LOWER MAIN RIVER, (MAN),
Natur-Museum und Forschungs Senchkenber, Frankfurt am Main (We many).
For primary bibliographic entry see Field 5
W76-05057

IFT OF MICROALGAE IN RICKLEAN, EDEN, (IN SWEDISH),
ea Univ. (Sweden). Dept. of Ecological Zoolo-
and Umea Univ. (Sweden). Dept. of Biology.
lacklund.
l Revy. 35(3): 115-118.

criptors: *Algae, *Microoganisms, Nutrients,
nt, *Aquatic drift.
ntifiers: *Ricklean(Sweden), Species composi-

e the end of the 19th century there have been a
ber of investigations concerning the periodici-
f algae in running waters. Sampling in the
r Ricklea has been done since Feb. 1972. Out
50-ml sample the algae in 25 ml were counted.
t, nutrients and hydrological regime are the
important factors in determining the amount
composition of species of the drift over the
.--Copyright 1975, Biological Abstracts, Inc.
-05071

RCURY DYNAMICS IN A WARMWATER EAM RECEIVING MUNICIPAL WASTE-TER,
igan State Univ., East Lansing. Inst. of Water
arch.
. Bainbridge, F. M. D'Itri, and T. G. Bahr.
roceedings of the 29th Industrial Waste Con-
ce, Part Two, May 7-9, 1974, Lafayette, Indi-
Purdue University, p 597-607. 2 fig, 5 tab, 36

riptors: *Mercury, *Municipal wastes,
vated sludge, Treatment facilities, Sewage
ment, *Waste water treatment, Fish,
os, Michigan, Golf courses, Fungicides,
ical analysis, Sludge, Analytical techniques.
ifiers: *Warm water stream, Chironomids,
Lansing(Mich), Red Cedar River(Mich),
eless atomic adsorption technique.

antial amounts of mercury are removed in
ctivated sludge process. A mercury budget
e East Lansing, Michigan, Sewage Treat-
Plant was developed. Mercury levels in fish,
os, water and sediment taken from a stretch
Red Cedar River which receives the plant's
nts, were determined. The effects of mercu-
gicides applied to a golf course adjacent to a
were determined. Four sampling stations
set up on the river. Samples collected in-
: sediments; benthos; sludge filter cake;
raw sewage; final effluent; fish; and cray-
The flameless atomic adsorption technique
ed to measure total mercury. The mean con-
tion of mercury in the sediment ranged from
arts per million (ppm) upstream to 0.40 ppm
tream. Mercury concentrations in fish
from 0.17 ppm to 0.72 ppm. Predator spe-
ntained two to three times as much mercury
zers or bottom feeding omnivores. Mean
ry concentrations of 0.15 ppm were found in
omids collected right below the sewage
ent plant outfall. It was estimated that about
ms of mercury per day enter the sewage
ent plant and about 20 grams per day enter
er through the outfall. The rest is adsorbed
e sludge which is filtered and incinerated,
the mercury to be released into the at-
ere. Only weak evidence suggests that mer-
om the fungicides used on the golf course,
have been stopped, were entering the river.
FIRL.)
5077

SAL OF SEWAGE SLUDGE TO SEA; D KINGDOM EXPERIENCE AND PRAC-

y of Agriculture, Fisheries and Food,
m-on-Crouch (England). Fisheries Lab.
nary bibliographic entry see Field 5E.
085

PRELIMINARY SUMMARY OF SLUDGE DEGRADATION STUDIES IN A MARINE BENTHIC ENVIRONMENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
W. P. Muellenhoff.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 349-389. 9 fig, 7 tab, 25 ref, 1 append.

Descriptors: *Sludge, *Degradation(Decomposition), Sewage sludge, Domestic wastes, Sewage, Carbon, Organic compounds, Inorganic compounds, Stabilization, Sulfates, Phosphates, Mathematical models, Oxidation-reduction potential, Dissolved oxygen, Benthic flora, Benthic fauna, Marine biology, Bioindicators, Pollutant identification.
Identifiers: *Total carbon, *Total inorganic carbon, Kjeldahl nitrogen, Organic carbon.

The rate and extent of the decrease of organic carbon in a digested domestic sewage sludge deposited on the sea floor were determined in laboratory and field tests. Total carbon (TC) and total inorganic carbon (TIC) were measured as indicators of the stabilization process, and sulfate, phosphate, nitrate, and Kjeldahl nitrogen were measured to record the chemical characteristics of the sludge. Concentrations of TC were found to decrease approximately 70% after 80 days at a pressure of one atmosphere. The TC decreased 30% in 47 days at increased pressure to simulate the deep sea. Oxygen consumption rates ranged from 3.74 to 0.55 02/sq m/day depending on the sludge source, type of digestion and time since deposit. Dissolved oxygen was depleted beyond one mm in the bed. Oxidation-reduction potential ranged from +150 mv at the sludge bed surface to -100 mv at 2 cm. Diffusion of hydrogen sulfide into underlying sediments began at 24 days and proceeded at a rate of 0.09 mm/day. Due to compaction, sludge beds decreased to one-half their original thickness in 80 days. Approximately 60% of all compaction occurred in the first day. A mathematical model of dissolved particulate and gaseous fractions of sludge bed carbon is being formulated to better understand the mechanisms and transfer rates of the sludge bed carbonaceous materials. (See also W76-05079) (Pinto-FIRL)
W76-05086

BIOASSAY METHODS AND IMPACT EVALUATION OF OCEAN DISPOSAL SITES,
Mounmouth Coll., West Long Branch, N. J.
For primary bibliographic entry see Field 5A.
W76-05087

EVALUATING THE IMPACT OF SLUDGE DISCHARGE TO SANTA MONICA BAY, CALIFORNIA,
California Univ., Berkeley; and Southern California Coastal Water Research Project, Berkeley.
F. K. Mitchell.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 417-433. 12 fig, 3 tab, 2 ref.

Descriptors: *Evaluation, *Sludge disposal, *California, *Sludge, Municipal wastes, Sludge digestion, Solids, Chemical oxygen demand, Sediments, Metals, Nitrogen, Phosphorus, Environmental effects.
Identifiers: *Santa Monica Bay(Calif), Santa Monica Canyon(Calif), Los Angeles(Calif), Ocean disposal, Sludge outfall.

Physical, chemical and biological effects of sludge discharge to Santa Monica Bay, California, are discussed. Municipal waste water from the City of Los Angeles is discharged through two separate outfalls. A detailed characterization of the waste material being discharged was made. It was found that the digestion of the primary sludge resulted in significant reductions of total solids, volatile matter, chemical oxygen demand, and grease without affecting the concentrations of total nitrogen and total phosphorus. Mass emission rates of the sludge discharge are similar to those of the combined primary and secondary effluents. Physical and chemical properties of the ocean sediments in the bay have been altered by the waste discharges, with the greatest effects observed in Santa Monica Canyon and near the sludge outfall. Depth profiles of sediment heavy metals concentrations indicate that the depths of significant quantities of sludge particulates are greater than one foot near the sludge outfall and one foot or less at distances greater than two miles down canyon from the sludge discharge. Although the areas affected are not biological deserts, biological evidence of environmental stress in the vicinity of the discharges has been found. (See also W76-05079) (Pinto-FIRL)
W76-05088

DETECTION OF SALMONELLAE IN THE ENVIRONMENT,
Center for Disease Control, Atlanta, Ga.
For primary bibliographic entry see Field 5A.
W76-05100

THE ENERGY FLOW THROUGH A LOTIC ECOSYSTEM, (IN SWEDISH),
Umea Univ. (Sweden). Dept. of Biology; and Umea Univ. (Sweden). Dept. of Ecological Zoology.
For primary bibliographic entry see Field 5B.
W76-05124

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME I.
National Research Council, Washington, D.C. Ocean Affairs Board.
For primary bibliographic entry see Field 5B.
W76-05135

THE ENVIRONMENTAL IMPACT OF AN OFFSHORE OIL SPILL,
Chevron Oil Field Research Co., La Habra, Calif.
C. D. McAuliffe.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 223a - 279, May 1973. 63 ref.

Descriptors: *Oil spills, *Environmental effects, *Aquatic environment, Ships, Accidents, Oil wells, Offshore platforms, Oil, Oil pollution, Water pollution, Oceans, Shores, Chemistry, Hazards, Aquatic plants, Aquatic animals, Biology, Marine biology.

The impact of an oil spill will depend upon the volume of spill, duration of spill, type of petroleum product, water temperature, and wind, wave, current conditions. An analysis of the environmental impact of an offshore oil spill incident was addressed to: (1) properties of oils and fate in marine environment, (2) effects on water quality, (3) effects on marine life, and (4) possible hazards to man. The biologic effects of ten major oil spills were discussed in detail. (See also W76-05135) (Sims-ISWS)
W76-05148

METHODS FOR STUDYING THE EFFECTS OF MARINE OIL SPILLS,
Woods Hole Oceanographic Inst. Mass.
J. F. Grassle.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board

Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 322a-346a, May 1973. 3 fig, 3 tab, 58 ref.

Descriptors: *Oil spills, *Environmental effects, *Benthic fauna, Oil, Oil pollution, Water pollution, Ships, Offshore platforms, Accidents, On-site investigations, Sampling, Analytical techniques, Benthos, Sediments, Aquatic life, Marine biology.

Features of several biological studies of oil spills were discussed and these recommendations were made: (1) the distribution of oil from spillages should be determined and a sampling program should be initiated to include both affected and unaffected areas (controls); (2) the sampling program must include samples for chemical and sediment analysis as well as biological samples; (3) the benthic subtidal and intertidal benthic infauna are likely to be severely affected by oil and may be quantitatively sampled to yield a relatively clear result; (4) whole taxa rather than selected species should be used in assessing effects; (5) all results should include species identification; (6) screens used in separation of animals from sediments should be small enough to include the whole size range of individuals of the species studied; and (7) sampling should include enough replication to clearly indicate that samples are representative. (See also W76-05135) (Sims-ISWS)
W76-05152

ANALYTICAL APPROACH IN THE EVALUATION OF BIOLOGICAL DAMAGE RESULTING FROM SPILLED OIL,
Consortium of Universities for Water Research, Montreal (Quebec).
G. La Roche.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 346b-374, May 1973. 4 ref.

Descriptors: *Oil spills, *Water pollution effects, *Fish, *Testing procedures, Biology, Marine biology, Laboratory tests, Oil, Oil pollution, Aquatic life, Water pollution, Clams, Fish toxins, Fishkill, Fish reproduction.

Sensitive interdisciplinary approaches should be used in the evaluation of biological damage resulting from pollutant exposures. This preliminary study showed evidence of damage with rather low single doses of crude oil or crude oil fractions, over a relatively short period of exposure (168 hours). None of the fish exposed or held as controls died during the 168 hour exposures described here. It would appear that, with the changes observed in the chemoreceptors or olfactory systems of exposed fish, they could just as well have died since they could not conceivably perceive changes in an otherwise viable natural environment. This indicated that it is not necessary to have mass kills to eliminate species from a particular area. All that is needed is to prevent them from coping with a viable environment by destroying their means of perception without which they cannot either find food, escape predators, or perform natural reproductive functions. (See also W76-05135) (Sims-ISWS)
W76-05153

BIOCONCENTRATION AND BIOTRANSFER OF AFLATOXIN,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-05169

BORON TOXICITY IN RED PINE FOLLOWING MUNICIPAL WASTE WATER IRRIGATION-RUA.
New Zealand Forest Service, Rotorua.
D. G. Neary, G. Schneider, and D. P. White.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 981-982, September-October, 1975. 1 fig, 2 tab, 10 ref. OWRT A-055-MICH(2).

Descriptors: *Boron, *Waste water(Pollution), *Waste water disposal, *Municipal wastes, *Red pine trees, Toxicity, Effluents, Nutrients, Irrigation, Foliar, Mass spectrometry, Humus, Soil profiles.
Identifiers: Nutrient absorption capacity, Land treatment sites, Necrosis, Middville(Mich), Nutrient toxicities.

Plants have a high nutrition absorption capacity and are susceptible to various nutrient toxicities. Minor chemical constituents in municipal wastes can cause contamination at land treatment sites. Studies have been conducted in which boron in waste water has been suspected to cause necrosis, or browning of the tips of pine needles, in the red pine tree. The effects of waste water containing concentrations of boron on red pines was studied. A number of plots were irrigated with varying amounts of waste water effluent from the Middevill, Michigan, waste water oxidation ponds. The irrigation was conducted over a period of two summers. Samples of the waste water analyzed weekly before irrigation showed low concentrations of boron. At the end of the irrigation the foliage was collected and ashed and analyzed for boron using a mass spectrograph. Humus collected in the area was analyzed in the same way. Evidence of foliar toxicity was noted in trees receiving 25, 50 and 88 mm/week of waste water despite the low concentration of boron. The effect can accumulate over a short period of time. Boron was found in even higher concentrations in the humus than in the foliage of the red pines. It was also found in high concentrations within the upper 30 cm of the soil profile. This raises questions about the feasibility of irrigating forest systems with waste water. (Pinto-FIRL)
W76-05177

SELECTIVE TOXICITY OF DETERGENTS AND HERBICIDES TO PHYTOPLANKTON,
Purdue Univ., Lafayette, Ind. Dept. of Botany and Plant Pathology.
C. A. Lembi, and S. E. Coleridge.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 497, $5.00 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center W. Lafayette, Technical Report No. 71. December 1975. 71 p, 28 tab, 42 ref. OWRT-A-025-IND(1).

Descriptors: *Detergents, *Phytoplankton, *Pesticide toxicity, Surfactants, Algae, Scenedesmus, Diatoms, *Herbicides, 2-4-D, Cyanophyta, Toxicity, Phosphates, *Phosphorus, *Growth rates, Water pollution effects.
Identifiers: *Phosphate detergents, *Carbonate detergents, Silvex, Micrasterias, Ankistrodesmus, Golenkinia, Pediastrum, Navicula.

The current trend to remove phosphorus from detergents has resulted in the replacement of phosphate-based products with inadequately tested carbonate-based detergents. Additional studies were conducted on the effects of the phenoxy herbicides 2,4-D and silvex on phytoplankton. Carbonate detergents at low concentrations stimulated diatom growth. At higher carbonate concentrations the increased alkalinity favored bluegreen algae over the diatoms. In comparing phytoplankton cultures treated with carbonate and phosphate detergents, the carbonate products caused the least growth reduction to bluegreen algae and were more toxic to diatoms at lower concentrations. Diatoms were not affected by silvex acid at 140 ppm; however planktonic green algae were affected at concentrations as low as 35 ppm. Growth of the phytoplankters, Scenedesmus, Ankistrodesmus, and Pediastrum was markedly decreased by 110 and 220 ppm 2,4-D acid, a sensitivity not previously noted by other researchers. Neither herbicide, however, caused compl mortality, even at highest concentrations.
W76-05181

THE EFFECTS OF A MARSH ON WAT QUALITY,
Hope Coll., Holland, Mich. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-05182

OBSERVATIONS ON PHYTOPLANKTON A PRIMARY PRODUCTION IN THE REGION THE ARGUIN BANK (MAURITANIA) IN API AND MAY 1972, (IN FRENCH),
Museum National d'Histoire Naturelle, P (France). Laboratoire des Peches Outre-Mer.
J. Reyssac.
Bull Inst Fondam Afr Noire Ser A Sci Nat. 36 51-61. 1974.

Descriptors: *Phytoplankton, Diato Chlorophyll, *Primary production, Salinity, T perature, *Dinoflgellates, Gymnodinium.
Identifiers: Arguin Bank, Caron-14, Cerati Coccolithophorid, *Mauritania, Upwelling.

Observations were made in the E and W zo The water in the former is warm and of high sa ty and is unaffected by upwelling. That in the l is affected by upwelling, colder and of lo salinity. The phytoplankton density is about 1 lion cells/l in both. Most of it is microplank consisting chiefly of diatoms. The most impor dinoflagellates are Gymnodinium in the east Ceratium in the west. The nannoplankton con mainly of coccolithophorids. Chlorophyll a primary production (measured by the C14 met are higher and more variable spatially in the In the east the lowest concentrations were f near the center of upwellings, the higher ones their peripheries. Copyright 1975, Biological stracts, Inc.
W76-05229

NUTRIENT DYNAMICS AND GAS PROD TION IN AQUATIC ECOSYSTEMS: THE FECTS AND UTILIZATION OF MERC AND NITROGEN IN SEDIMENT-WA MICROCOSMS,
Utah Center for Water Resources Rese Logan.
D. B. Porcella, V. D. Adams, P. A. Cowan, S. Austrheim Smith, and W. F. Holmes.
Available from the National Technical Info tion Service, Springfield, Va 22161, as PB-25 $6.00 in paper copy, $2.25 in microfiche. Water Research Laboratory Publication PR 121-1, November 1975. 142 p, 51 fig, 23 tab ref, 4 append. OWRT B-081-UTAH(2), 0001-3942.

Descriptors: Eutrophication, Reser *Nutrients, *Phosphorus, *Nitrogen, Ca Iron, *Mercury, *Algae, *Gases, *Ecosys Cyanophyta, *Sediment-water interf Anabaena, Analytical techniques, Lakes, Pr tivity, Sediments.
Identifiers: Hyrum Dam(Utah), *Micro technique, Nutrient dynamics.

Sixteen sediment-water microcosms design allow complete gas, liquid, and solid balances of gases, nutrients, and mercury studied under dark conditions or varying lig tensity for a period of 189 days. Results ind that the microcosm technique is a very sen method of analyzing microbial dynamics in ment water systems. Gas quantity and com tion changes were easy to monitor and were cially sensitive to light and nutrient varia Nitrogen fixation occurred in all lighted sy (blue-green algae nitrogen fixers, Anabaena others) and was adequate to insure th nitrogen limitation occurred even though ni limitation was imposed on the system. Sedi

pparently did not act as a significant source of itrogen. Iron and phosphorus were in excess and s such were closely linked as would be predicted n the basis of chemical equilibria. Non-equilibri- m chemical behavior of such elements would ap- arently result only when appreciable amounts of he compound or element are utilized in growth. he microcosm technique is an excellent method or showing nutrient dynamics in sediment-water ystems; the control of environmental variables al- ows interpreting at least some of the major factors hich control productivity in lakes.
/76-05246

ATURALLY OCCURRING ORGANIC COM- OUNDS AND ALGAL GROWTH IN A UTROPHIC LAKE,
tah Center for Water Resources Research, ogan.
. D. Adams, R. R. Renk, P. A. Cowan, and D. B. orcella.
vailable from the National Technical Informa- on Service, Springfield, Va 22161 as PB-250 730, .00 in paper copy, $2.25 in microfiche. Utah ater Research Laboratory Publication RWG137-1, June 1975. 140 p, 18 fig, 16 tab, 303 f, 3 append. OWRT B-104-UTAH(1), 14-31- 01-4134.

escriptors: Eutrophic zone, Lakes, *Organic mpounds, *Algae, Gas chromatography, Mass ectroscopy, *Utah, *Eutrophication, Water pol- ion effects, Reservoirs, Bioassay, Chla- ydomonas, Pollutant identification.
entifiers: Hyrum Reservoir(Utah), *Algal owth, Acetaldehyde, Methanol, Ethanol, opanal, Acetone, Propanol, Aphanizomenon, utrophic lakes.

e literature was reviewed with respect to natu- ly occurring organic compounds. Their identity d effects on life forms are listed in tabular form. ethods of separation and identification of trace ganics in aquatic systems are discussed and ap- ed to a reservoir. Six organic compounds etaldehyde, methanol, ethanol, propanal, etone, and 2-propanol) were identified and onitored in the reservoir from September 1974 to ril 1975. Algal populations were simultaneously served and bioassays were performed on some these populations to determine the effects of compounds. No effects of the compounds on algae were observed at the concentration els found in the reservoir. Possible sources of se compounds were discussed. Chla- domonas reinhardi (axenic culture) produce anol, propanal, and acetone, thus suggesting sible alga sources of the compounds observed. the fall of the year, high concentrations of hanol, ethanol, and acetone are the result of terial action on dying mats of Aphanizomenon.
6-05253

TRIBUTION OF NUTRIENTS IN LOUI- NA'S COASTAL WATERS INFLUENCED BY E MISSISSIPPI RIVER,
isiana Wildlife and Fisheries Commission, / Orleans. Div. of Oysters, Water Bottoms and oods.
primary bibliographic entry see Field 5B.
-05259

EXCHANGE AND GROWTH POTENTIAL PHOSPHORUS IN ALGAE CULTURES,
is Tech Univ., Lubbock. Dept. of Civil En- ering.
. Sweazy, M. C. Lockett, G. W. Reid, and J. obertson.
national Journal Environmental Studies), Vol. 7, No. 3, p. 193-200, 1975. 8 fig, 3 tab, OWRT B-177-TEX(5).

riptors: *Phosphorus, *Algae, *Growth rates, ophication, Mathematical models, Mode of n, Laboratory tests, Absorption, Water pollu- ffects, Cultures.

Identifiers: Algal growth potential.

To establish relationships between total phosphorus budget, available phosphorus, algal growth, and eutrophication, water containing dissolved solids, nitrogen, phosphorus, minerals, and vitamins was used to culture starved algal populations. Applicability of the Watt-Hayes Steady State Model describing phosphorus transfer and exchange to eutrophication was determined. From inorganic, particulate, and organic steady state phosphorus concentrations and exchange rates resulting from various phosphorus inputs, equations predicting exchange rates, teady state phosphorus concentrations, and maximum algal growth were developed. Correlations between initial and resulting particulate steady state phosphorus concentrations and between particulate steady state phosphorus concentrations and maximum algal growth were high. Although the equations developed from this study are valid for data obtained in the investigation, factors such as sediment-water interchange, littoral vegetation, and other chemical, physical, or biological processes should be considered for proper representation. If inorganic and organic phosphorus concentrations are such that plankton uptake rate balances loss rate, no particulate phosphorus increase is possible without external input. With inorganic or organic phosphorus additions, plankton loss and uptake rates are altered and new steady state phosphorus concentrations result. Severe eutrophication can be defined in terms of phosphorus addition in high enough concentrations to prevent establishment of steady state conditions. (Buchanan-Davidson--Wisconsin)
W76-05266

EFFECT OF PHENOLS AND THEIR OXIDATION PRODUCTS ON AQUATIC PLANTS AND CONTENT OF SULFHYDRYL GROUPS IN THEM, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Universitet (USSR).
D. I. Stom, L. P. Bobovskaya, S. S. Timofeeva, G. V. Kalmychkov, and O. M. Kozhova.
Dokl Akad Nauk SSR Ser Biol. 216(3): 698-701, 1974.

Descriptors: *Phenols, Aquatic plants, *Oxidation, *Toxicity, Water pollution effects, Organic compounds, Organic wastes, Chemical wastes, Absorption.
Identifiers: *Dunaliella-Sp, *Elodea-Canadensis, *Nitella-Sp, *Pyrocatechol, *Hydroquinone.

Experiments on aquatic plants (Elodea canadensis, Nitella sp., Dunaliella sp.) to determine the possible relation between the ability of aquatic plants to oxidize phenols and the effect of phenolic compounds on the content of sulfhydryl and disulfide groups in plant tissue showed that the higher toxicity of pyrocatechol and hydroquinone for aquatic plants in comparison with other phenols is related with their ability to oxidize phenols. One of the most probable biochemical mechanisms of the manifestation of the toxic effect of the oxidation products of phenols is the blocking of sulfhydryl groups by them. The oxidation of pyrocatechol and hydroquinone uptake into the cell, which is accompanied by a decrease of the content of sulfhydryl groups, the inability of solutions of p-benzoquinone, pyrocatechol and hydroquinone to inhibit the movement of protoplasm in the presence of thiol compounds in the incubation medium and the presence of general features in the effect of quinones and the metabolic poison sodium p-chloromercuribenzoate on plants: all these facts indicated the specific, selective effect of quinones, pyrocatechol and hydroquinone on aquatic plants. --Copyright 1975, Biological Abstracts, Inc.
W76-05276

STRATEGY OF BIOLOGICAL MONITORING, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-05301

THE CAUSE OF TROUT FISH KILLS OCCURRING IN THE WATER FROM THE AERATED HYPOLIMNION OF DEEP LAKES,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
R. S. Ingols.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 721, $4.00 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC 0176, January 1976, 16 p, 1 fig, 4 tab, 18 ref. OWRT A-056-GA(1). 14-31-0001-5010.

Descriptors: *Fishkill, *Hypolimnion, *Dissolved oxygen, *Sulfides, *Manganese, Metals, Hardness(Water), *Trout, Lakes, *Georgia, *Arkansas, Anaerobic bacteria, *Toxicity, Lethal limit, Impoundments, Fish hatcheries, Water pollution effects.
Identifiers: Metal ions, Lanier Lake(Ga), Greers Ferry Hatchery(Ark).

The need for large volumes of cold water to culture trout in Georgia and Arkansas has led to the use of the hypolimnetic water of power impoundments. The need for dissolved oxygen (DO) in the water has been well established. Long periods of stratification produces zero DO. This condition has permitted the solution of metal ions and the production of anaerobic bacterial by-products. Sulfides have been generated in sufficient concentration to be the dominant lethal factor below Lake Lanier. Manganese at 1.0 and 2.0 mg/l appears to be the dominant lethal factor at the Greers Ferry Hatchery in Arkansas, although sulfides may also contribute. The toxicity of 5 mg/l manganese can be controlled by the presence of enough calcium ions in the water according to the data of this report. Hydrogen peroxide can reduce hydrogen sulfide toxicity. Permanganate has been used to reduce the toxicity of both lethal factors, but must be carefully controlled.
W76-05325

SOME GENERAL RELATIONS BETWEEN THE BIOMASS OF PLANKTONIC FILTER FEEDERS AND THEIR FOOD, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
G. G. Vinberg.
Gidrobiol Zh. 10(5): 109-112, 1974.

Descriptors: *Biomass, *Bacteria, *Zooplankton, Phytoplankton, *Food chains, Food webs.
Identifiers: *Plantonic filter feeders.

Formulas are presented for determining the relation between the biomass of zooplankton filter feeders and biomass of bacterioplankton or phytoplankton in a general form applicable to the particular case of a stationary biomass of the food being consumed.--Copyright 1975, Biological Abstracts, Inc.
W76-05326

HYGIENIC ASSESSMENT OF CERTAIN SURFACE-ACTIVE SUBSTANCES-THE COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES (GIGIYENICHESKAYA OTSENKA NEKOTORYKH POVERKHNOST-NOAKTIVNYKH VESHCHESTV-KOMPNENTOV STOCHNYKH VOD PREDPRIYATIY TEKSTIL'NOY PROMYSHLENNOSTI),
For primary bibliographic entry see Field 5A.
W76-05342

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
G. Wood.

Australian Water Resources Council, Canberra, Technical Paper No. 15, 1975. 238 p 8 fig, 16 tab, 590 ref.

Descriptors: *Eutrophication, *Australia, *Reviews, *Research priorities, Aquatic environment, Nutrients, Water quality, Freshwater, Surface waters, Information exchange, *Bibliographies, Water pollution effects.

The results are presented of a project undertaken to review international research work on eutrophication, to assess the applicability of the information to Australian conditions, and to identify problem areas requiring research in Australia. It is concluded that, judging by the results of overseas research, Australian conditions are such that actual or potential loss of water quality through eutrophic effects probably exists. However, there is and has been insufficient relevant research in Australia to identify possibly unique features of its aquatic environment which might reinforce or mitigate this conclusion. Information is lacking over such a broad range that no research effort is likely to be wasted by duplication; but collection and coordination of results at catchment, State and national level is necessary. The establishment of a National Water Research Centre should be considered. (CSIRO)
W76-05405

BACTERIAL POLLUTION IN LAKE BURLEY GRIFFIN,
Royal Military Coll., Duntroon (Australia). Dept. of Geography.
J. S. Burgess, and L. J. Olive.
Water (Journal of the Australian Water and Wastewater Association) Vol. 2, No. 4, p 17-20, December, 1975. 2 fig, 4 tab, 8 ref.

Descriptors: *Water pollution sources, *Coliforms, *Lakes, *Australia, *Sewage bacteria, Watersheds(Basins), Recreational facilities, Urban runoff, Surface runoff, Bacteria, Water pollution effects.
Identifiers: Lake Burley Griffin(A.C.T.), Queanbeyan(N.S.W.), Canberra(A.C.T.).

Recreational use of Lake Burley Griffin in the Australian Capital Territory is sometimes interrupted by violation of bacterial standards. It has been thought that high levels of faecal coliforms in the lake are simply the result of discharge of sewage into the headwaters by the nearby town of Queanbeyan. Examination of bacterial counts in the lake and in the catchment areas reveal that, while discharges of Queanbeyan sewage are a major source of faecal coliforms, significant inputs also occur from rural and Canberra urban runoff. (CSIRO)
W76-05407

EFFECTS OF AIR INJECTION AT PROMPTON LAKE, WAYNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5G.
W76-05413

THE EFFECT OF TREMATODE LARVAL INFESTATION OF HYDROBIA ULVAE ON ITS RESISTANCE TO DRYING AND WATER-FRESHENING, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
V. Ya. Berger, and A. P. Kondratenkov.
Parazitologiya (Leningr). 8(6): 563-564, 1974.

Descriptors: *Gastropods, *Tremotodes, *Invertebrates, Worms, Aquatic animals, *Infection, Drying, Water purification, Larvacides, Resistance, Water pollution effects.
Identifiers: Cryptocotyle-Sp, Hydrobia-Ulvae, Maritrema-Subdolium, Microphallus-Somateriae, Paramonostomum-Alveatum.

Gastropods H. ulvae infected with trematode larvae (KMaritrema subdolium, Cryptocotyle sp., Microphallus Somateriae, Paramonostomum alveatum) have a lower resistance to drying and water-freshening as compared to sterile animals. The deterioration in the isolation of organisms from the environment affects the resistance, proved by a high salt l oss rate in infected hydrobians placed into distilled water. Copyright 1975, Biological Abstracts, Inc.
W76-05421

EFFECT OF SALINITY ON THE SURVIVAL AND REPRODUCTIVITY OF OLIGOCHAETES OF THE FAMILY TUBIFICIDAE OF THE DNIEPER-BUG ESTUARY, (IN RUSSIAN),
T. G. Moroz.
Gidrobiol Zh. 10(5): 102-104, 1974.

Descriptors: *Oligochaetes, *Salinity, Estuaries, *Reproduction, Mortality, *Tubificids, Water pollution effects.
Identifiers: Limnodrilus-Claparedeanus, Potamothrix-Hammoniensis, Potamothrix-Moldaviensis, Psammoryctides-Barbatus, *USSR(Dnieper-Bug Estuary).

Data from an investigation of freshwater oligochaetes of the family Tubificidae, the euryhaline Psammoryctides barbatus, Potamothrix hammoniensis and Potamothrix moldaviensis and the oligohaline Limnodrilus clapareanus are presented showing that a brief increase of salinity is not lethal, but only reduces the abundance of the populations and in certain cases impoverishes the species composition. A further increase of salinity in the Dnieper-Bug Estuary (USSR) (more than 13%) leads to 100% mortality in these freshwater species; for most this limit was even lower.--Copyright 1975, Biological Abstracts, Inc.
W76-05454

DIELDRIN CONTAMINATION OF CHANNEL CATFISH, INVERTEBRATES AND MINNOWS FROM THE DES MOINES RIVER,
Iowa Cooperative Fishery Unit, Ames.
R. L. Kellogg.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 046 $5.50 in paper copy, $2.25 in microfiche. MS thesis, 1974. 120 p. 25 tab, 81 ref, 1 append. OWRT A-042IA (2).

Descriptors: *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Channel catfish, *Invertebrates, *Minnows, Dieldrin, Iowa, Seasonal, Aldrin, Fish food organisms, Aquatic insects, DDE, DDT, Crayfish, Mayflies, Agricultural runoff.
Identifiers: Des Moines River(Iowa), Biomagnification.

Dissolved and suspended dieldrin fractions varied seasonally. Positive correlation between dissolved dieldrin and surface runoff, but not between suspended dieldrin and surface runoff supported the hypothesis that agricultural aldrin applications caused dieldrin in the river due to runoff. Dieldrin varied in bottom sediments seasonally, but was higher in suspended matter. Seasonal dieldrin variations were observed in aquatic insects and minnows; DDE levels remained static, and DDT was low. In crayfish, dieldrin was low and DDE-DDT higher. In minnows dieldrin varied seasonally and between species; DDT was low; and DDE was often higher and varied seasonally. Dieldrin varied with catfish size; DDE-DDT levels were generally higher and increased with size. Catfish condition factors correlated positively with size but not with dieldrin levels. Biomagnifications for aquatic insects, minnows, and catfish were 4620, 7540, and 6920, respectively. Dieldrin biomagnification from catfish food to muscle tissue was low, suggesting that the principal dieldrin source was water not food. Seasonal dieldrin trends in aquatic organisms did not correspond to dieldrin exposure levels, suggesting that other environmental and physiological factors are important regulators of dieldrin dyanmics in these organisms. (Buchanan-Davidson--Wisconsin)
W76-05457

EFFECT OF SURFACTANTS ON THE SURFACE ABSORPTION OF OXYGEN INTO WATER,
Iowa State Univ., Ames. Dept. of Chemical Engineering; and Iowa State Univ., Ames. Dept. of Nuclear Engineering.
D. D. Lee.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 03[illegible] $6.00 in paper copy, $2.25 in microfiche. PhD thesis, 1973. 132 p. 33 fig, 4 tab, 37 ref, 2 append. OWRT B-030-IA (2).

Descriptors: *Oxygen, *Surfactants, *Mass transfer, Ice cover, Absorption, Air-water interfaces, Oxygenation, Electrolytes, Diffusion.
Identifiers: Sodium pyrophosphate, Aerosol O.T, Dreft, Bacto-peptone, Glucose oxidase.

To determine the practicality of oxygenating ice covered lakes and rivers, the effects of surface active agents on the oxygen interfacial mass-transfer coefficient into water were studied. At low turbulence levels in stirred cell reactors, low surface active agent and electrolyte concentrations change the coefficient; the change was unpredictable a 10-15% increases, no changes, or decreases were observed, apparently due to interfacial turbulence increases resulting from hydrodynamic disturbances caused by small amounts of impurities. Higher surfactant concentrations can form layers, partially reducing interfacial turbulence and mass transfer rates. Eddy diffusion effects at air-water interfaces were observed with an oxygen microprobe. The coefficient's linear dependence on square root of eddy renewal rate in turbulent gas-liquid interfacial mass transfer is shown. Using glucose oxidase as a contaminant, formation of an interfacial stagnant layer which varied in thickness with glucose oxidase concentration, was demonstrated. The coefficient was affected by low surfactant levels; usually the coefficient decreased, but this was impossible to predict. The microprobe technique was promising in determining what happens during interfacial maass transfer at or near the interface. When a surface layer is formed at the interface, the microprobe can approximate the thickness and oxygen profile across it. (Buchanan-Davidson--Wisconsin)
W76-05458

MICRODYNAMICS OF DETRITUS FORMATION AND DECOMPOSITION AND ITS ROLE AS A STABILIZATION INFLUENCE IN FRESH WATER LAKES,
Rensselaer Polytechnic Inst., Troy, N. Y. Fresh Water Inst.
C. W. Boylen, L. S. Clesceri, S. Kobayashi, and A. Park.
Report FWI 75-13, December 1975. 26 p. 10 tab, ref. NSF BMS69-01147 A09.

Descriptors: *Microbial degradation, *Detritus, Aquatic plants, Lakes, Vegetation, New York, Phenology, Carbon, Oxygen, Mass transfer, Model studies, Polymers, Productivity, Succession, Organic compounds, Sediments, Phosphorus compounds, Nitrogen compounds.
Identifiers: *Lake George(NY), Deoxyribonucleic acid.

Detritus formation and decomposition microdynamics in Lake George, New York, showed distinctive differences with respect to sloughing and mortality between macrophytes and that of entering allochthonous and autochthonous detritus which is decomposed throughout the winter at rates dependent on temperature and the chemical composition of organic material. There was no association between invertebrate num-

and macrophyte decomposition rates. Nitrogen and phosphorus release rates were similar to decomposition rates. Functions of a macrophyte submodel include morphological changes influenced by depth, fruiting habits, overwintering productivity, and sediment preference. It can simulate sloughing and die-back in diverse species. Plant structural components gradually decreased from late autumn to spring. Deoxyribonucleic acid levels indicated microbial cycling and succession. Changes in organic polymers and increases in sediment DNA closely paralleled changes in cellulose. There was no increase in dissolved organic carbon, indicating no release of phosphorus or nitrogen to overlying water during active growth periods. The organic content of the particulate load to the lake was high. The importance of detritus in stabilizing seasonal nutrient flux in lake ecosystems is being studied and its role in nutrient levels and biological responses. (Buchanan-Davidson--Wisconsin)
W76-05459

TUDIES ON THE FRESHWATER ALGAE OF HE SUDAN. II. THE DISTRIBUTION OF THE ACILLARIOPHYCEAE OF WADI GALOL, EBEL MARRA,

Khartoum Univ. (Sudan). Dept. of Botany.
. G. A. Karim.
Hydrobiologia, Vol. 47, No. 1, p. 31-42, 1975. 6 lates, 18 ref.

escriptors: *Aquatic algae, *Diatoms, *Africa, ystematics, Periphyton, Distribution, Streams, abitats, Algae.
lentifiers: Jebel Marra(Sudan), Pennales.

enthic and planktonic diatoms in the Galol Valy, Jebel Marra, Sudan, were collected and entified. Some diatoms were found growing on amentous algae or weeds in running water. pithemia sorex was the most common epiphyte water weeds. Diatoms are associated with filaentous algae growing in shallow pools left behind hen the creeks drained into the perennial stream. is difficult to distinguish between epiphytic and ipelic periphyton, since habitat exchange tween the two is very rapid. Some diatoms were served among sediments and fallen leaves on e edge of the creeks in association with algae. pilithic periphyton were associated with algae owing on rock surfaces in the brook. Some were nd in open water, and some were occasionally nd in phytoplankton of stream and creeks. ere were no striking qualitative or quantitative ferences in planktonic samples collected from brook or creeks, but the benthic community of h was more varied. Epiphytic periphyton were largest community, while the epilithic habitat pported fewer diatoms. Generally green filantous algae supported more periphyton than mentous blue-green algae. All diatoms beged to the Pennales and are illustrated. Biradineae predominated in periphyton and Aradineae in phytoplankton. Findings are comed with those found in other regions. chanan-Davidson--Wisconsin)
6-05460

OSPHORUS QUOTA AND THE LOROPHYLL: CARBON RATIO IN MARINE /TOPLANKTON,

staffnage Marine Research Lab., Oban otland).
ett, J. C. Cottrell, D. O. Trew, and B. J. B. od.
nology and Oceanography, Vol. 20, No. 4, p. 603, 1975. 4 fig., 4 tab., 34 ref.

riptors: *Equations, *Phosphorus, *Marine *Chlorophyll, *Carbon, *Growth rates, el studies, Regression analysis, Detritus, iration, Photosynthesis, Limiting factors, ophication, Cultures, Europe, Light intensity. tifiers: *Loch Creran(Scotland).

Studies of nutrient-limited algal growth permitted derivation of an equation relating algal chlorophyll: carbon ratio to cell nutrient quota. This was tested using phosphorus as the nutrient and phytoplankton during the spring increase in Loch Creran, Scotland. The nutrient quota was the phosphorus: carbon atomic ratio. A regression method was used to estimate detrital phosphorus and carbon to correct total particulate material measurements. Phosphorus was not the only limiting nutrient, so subsistance quota estimates were apparent rather than true. The equation describes the relation between phytoplankton chlorophyll, phosphorus, and carbon contents over two three-four week periods. During the period of phytoplankton increase, the subsistance quota and maximum algal chlorophyll: carbon ratio were estimated as 0.014 atom phosphorus/atom carbon and 0.083 g chlorophyll/g carbon; during the period of decline they were 0.0062 and 0.040, respectively. It should be possible to apply this quantitative model of algal nutrient/growth relationships to mixed species of natural phytoplankton with improved details, although the situation is more complex than was assumed. Computer simulations showed that the model combined with simple models of the relation between light intensity and photosynthesis can explain many environmentally induced changes in growth and chemical composition of algal populations. (Buchanan-Davidson--Wisconsin).
W76-05461

SOME EFFECTS OF PROPIONATE ON THE GROWTH OF RHODOPSEUDOMONAS SPHEROIDES S,

Tokyo Metropolitan Univ. (Japan). Dept. of Biology.
K. Maruyama, and H. Kitamura.
Agricultural and Biological Chemistry, Vol. 39, No. 8, p. 1521-1526, 1975. 1 tab., 5 fig., 21 ref.

Descriptors: *Photosynthetic bacteria, *Growth rates, Carbon, Inhibition, Aerobic conditions, Anaerobic conditions, Light, Metabolism.
Identifiers: *Propionate, *Rhodopseudomonas spheroides S, Glucose, Acetate, Sodium bicarbonate.

Carbon compound utilization is used to classify photosynthetic bacteria. Effects of propionate on Rhodopseudomonas spheriodes S growth were studied in the presence of various carbon compounds. Propionate strongly inhibited Rhodopseudomonas growth in media containing glucose as carbon source under aerobic-dark conditions, but not under anaerobic-light conditions. Inhibition was restored by adding acetate or sodium bicarbonate to the medium, but the mechanism seemed to differ. Pyruvate, acetoin, and acetaldehyde accumulated in the medium during growth inhibition caused by addition of propionate; acetoin and acetaldehyde may be secondary products from pyruvate. The results suggested operation of the methyl-malonyl-CoA or alpha-hydroxyglutarate pathway. Propionate inhibited growth on glucose medium under aerobic-dark conditions, but glucose consumption continued, suggesting that propionate altered the energy flow in growth. Propionate may uncouple biological energy from cell growth or inhibit the metabolic pathway. Bacteria did not grow on sodium bicarbonate medium but with added propionate growth occurred under aerobic-dark conditions, suggesting that not propionate but its intermediate(s) inhibited growth on glucose. When glucose was the carbon source under anaerobic-light conditions, growth was not inhibited as strongly by propionate as when inhibition was aerobic; this may reflect a different metabolic pathway for glucose during aerobic and anaerobic growrh. (Buchanan-Davidson--Wisconsin).
W76-05462

ALGAL NITROGEN FIXATION IN CALIFORNIAN STREAMS: DIEL CYCLES AND NOCTURNAL FIXATION,

California Univ., Berkeley. Div. of Sanitary Engineering.
A. J. Horne.
Freshwater Biology, Vol. 5, No. 5, p. 471-477, 1975. 3 fig., 1 tab., 19 ref.

Descriptors: *Algae, *Nitrogen fixation, *Nocturnal, *Biorhythm, California, Diurnal, Nostoc, Streams, Cyanophyta, Respiration, Photosynthesis.
Identifiers: *Rocky Creek(Calif).

Diurnal nitrogen-fixation by Nostoc during seasonal growth cycle peaks on clear and cloudy days were investigated in Rocky Creek, California. A definite nitrogen-fixation peak was observed during darkness which could not be explained by a tailing of daytime fixation. Maximum nitrogen-fixation rates occurred in the light but fixation also occurred in the dark, with the lowest fixation in the early evening and a steady increase through the night. Dark activity occurred on both clear and rainy days, but was not obvious in Nostoc growing in heavily shaded areas. It is postulated that competition for reductant between nitrogenase and other processes, especially photorespiration, controlled the diel cycle rather than variations in the intracellular nitrogen pool. Because Nostoc is most abundant in unshaded areas and one-third of each day's nitrogen is fixed in the dark, studies should take dark fixation into account. The results suggest that nitrogenfixation in Rocky Creek is an energetically marginal phenomenon, susceptible to demands for reductant by other processes, especially photorespiration. However nitrogen-fixation is nutritionally essential in this nitrogen-depleted environment and occurs when surplus reductant is available, even at night. (Buchanan-Davidson-Wisconsin).
W76-05463

INPUT-OUTPUT MODELS WITH SPECIAL REFERENCE TO THE PHOSPHORUS LOADING CONCEPT IN LIMNOLOGY,

Canada Centre for Inland Waters, Burlington (Ontario).
R. A. Vollenweider.
Schweizerische Zeitschrift fur Hydrologie, Vol. 37, No. 1, p. 53-84, 1975. 7 fig., 24 ref.

Descriptors: *Input-output analysis, *Mathematical models, *Phosphorus, *Eutrophication, Limnology, Balance of nature, Export, Volume, Equations, Estimating, Nitrogen, Depth.
Identifiers: Water residence time, Water renewal time, Mass balance.

Elementary mass balance and export models are described in relation to eutrophication as caused by phosphorus and nitrogen. For mass balance of lakes and mass export from a lake drainage area a continuity of mass equation is used. A linear model for conservative substances had limited application. A model for non-conservative substances permits derivation of the extent of reaction and velocity of movement. Comparisons of relative nitrogen and phosphorus residence times show that with increasing eutrophication nitrogen metabolism increases beyond simple proportionality, thus explaining the transition from phosphorus to nitrogen limitation in eutrophic lakes. The model was modified, incorporating a probability that a particular fraction of water is replaced by new water or that a particular fraction of a dissolved or suspended substance is washed out. A non-linear model shows quantitative and qualitative changes in lake metabolism; the most important change during eutrophication is hypolimnetic oxygen reduction. Criteria for phosphorus loading in relation to the ratio of mean depth: water fill-in-time suggests that lakes having long water renewal times are more sensitive to phosphorus loading than would appear from mean

depth only. An export model defining average concentration of a substance at a particular river transect is being used characterize drainage systems. (Buchanan-Davidson--Wisconsin).
W76-05464

EFFECT OF PHOSPHORUS DEFICIENCY ON TWO ALGAE GROWING IN CHEMOSTATS,
Fisheries and Marine Service, Winnipeg (Manitoba).
F. P. Healey, and L. L. Hendzel.
Journal of Phycology, Vol. 11, No. 3, p. 303-309, 1975. 5 fig., 1 tab., 34 ref.

Descriptors: *Phosphorus, *Deficient elements, *Nutrient requirements, *Algae, Chemical properties, Metabolism, Anabaena, Scenedesmus, Carbohydrates, Cultures, Proteins, Chlorophyll, Lipids.
Identifiers: Nucleic acids, Alkaline phosphatase.

Effects of phosphorus deficiency on composition and metabolism of Anabaena variabilis and Scenedesmus quadricauda were studied in a phosphorus-limited chemostat. There were three patterns of changes as a function of dilution rate. Most aspects of composition changed progressively with dilution rate. Storage carbohydrate content generally increased while cEllular nitrogen phosphorus, protein, nucleic acid, chlorophyll, protein: carbohydrate ratio, and RNA:DNA ratio in S. quadricauda, decreased with increasing deficiency. The second pattern included metabolism changes showing great sensitivity of onset of phosphorus deficiency; alkaline phosphatase activity and the ability to take-up phosphate increased with increasing deficiency at higher dilution rates. In the third pattern, the S. quadricauda decreasing phosphorus and increasing carbohydrate contents with increased phosphorus deficiency were between the first and second patterns. The A. variabilis decreasing nitrogen content was between the first and third. All parameters are potential indicators of nutritional physiology of natural algal populations. The results permit evaluation of indicators relative to characteristics of an ideal bioassay. The metabolic indicators did not increase between moderate-extreme deficiency, but most aspects of composition changed over a broad range of degrees of deficiency. (Buchanan-Davidson--Wisconsin).
W76-05465

SULPHIDE FORMATION AND CHEMICAL COMPOSITION OF BOTTOM SEDIMENTS OF SOME ITALIAN LAKES,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
J. I. Sorokin.
Hydrobiologia, Vol. 47, No. 2, p. 231-240, 1975. 1 fig., 4 tab., 15 ref.

Descriptors: *Sulfides, *Sulfates, *Bottom sediments, *Lakes, Chemical properties, Eutrophication, Sulfur bacteria, Reduction(Chemical), Brackish water, Hydrogen sulfide, Oxygen sag, Salinity, Alpine, Europe, Methane bacteria, Anaerobic conditions, Water pollution effects, Meromixis.
Identifiers: *Lago Maggiore(Italy), *Lago Lugano(Italy), Lake Faro(Sicily), Lake Ganzirri(Sicily).

Sulfide formation and sulfate reduction were studied in bottom sediments of the deep subalpine Lakes Maggiore and Lugano. Sediment sulfide accumulations were the highest ever recorded in limnology. Sediment and water sulfate concentrations were very low. Sulfate oxidation to hydrogen sulfide and accumulation of sulfide ions were very rapid. In Lago Lugano, hydrogen sulfide diffused into the water and was quickly oxidized causing an oxygen deficit in the hypolimnion. Sediment sulfide concentrations of the lagoon of Venezia and two brackish Sicilian lakes (Faro and Ganzirri) were 2-3 times less. Organic matter accumulated rapidly in Maggiore and Lugano; organic carbon contents were high. High carbon:nitrogen and low nitrogen:phosphorus ratios indicated nitrogen loss in lake sediments due to reduction to elemental nitrogen. Phosphorus accumulation was high. Methane-producing microflora were found in Lago Maggiore sediment and Thiobacilli, Beggiatoa, and Metallogenium were found in bottom water layers. In Lago Lugano bacterial biomass in sediments was high, and a thick white film of Beggiatoa cell filaments filled with drops of sulfur was found on the sediment surface. Lake stagnation will gradually increase hypolimnetic salt concentration. Hydrogen sulfide accumulation in sediments and formation of an anaerobic zone due to pollution and eutrophication can change these deep lakes to meromictic basins. (Buchanan-Davidson--Wisconsin).
W76-05466

CONTROL OF AQUATIC VEGETATION IN NEW YORK STATE,
New York State Coll. of Agriculture and Life Sciences.
J. Adamec.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 207, $4.50 in paper copy, $2.25 in microfiche. NSF-RA-G-73033. Report SS-404, September 1973. 68 p. 63 ref., 1 append.

Descriptors: *Aquatic weed control, *New York, Nutrient removal, Herbicides, Chemcontrol, Copper sulfate, Diquat, Mechanical control, Harvesting, Disposal, Vegetation regrowth, Cost comparisons, Permits, Biocontrol, Fish, Application methods, Management, Legislation, Toxicity.
Identifiers: White amur.

The eutrophication process and the consequent proliferation of aquatic weeds are discussed. Most of the aquatic plant control in New York State is done by application of chemicals, such as copper sulfate and diquat. However, the major disadvantage of chemical control is the cumulative toxicity potential. Although mechanical harvesting is the preferred treatment method, it is utilized on a small scale and only where chemical applications are prohibited. Mechanical harvesting gives immediate relief while not drastically upsetting the ecosystem. Harvesting removes excess nutrients from waters by removing all vegetation including filamentous algae. The various successful harvesting methods are described. While still in the evaluation stage, the white amur (Ctenopharyngodon idella) shows great potential as a weed control agent. The fish has an indescriminate, voracious appetite, it does not compete for food with native fishes, and the possibility that it will spread is slight. It is regarded as an excellent food fish and it also has potential as a sport fish. The application for permit to use chemicals, New York State rules and regulations relating to the use of chemicals, and cost comparison of harvesting and chemical control are contained in the appendices. (Auen-Wisconsin)
W76-05467

RESPONSE OF THE SPOKANE RIVER PERIPHYTON COMMUNITY TO PRIMARY SEWAGE EFFLUENT AND CONTINUED INVESTIGATION OF LONG LAKE,
Eastern Washington State Coll. Cheney. Dept. of Biology.
R. A. Soltero, and A. F. Gasperino.
Washington Department of Ecology, Report 75-15, July 1975. 129 p. 22 fig., 34 tab., 83 ref.

Descriptors: *Reservoirs, *Water pollution effects, *Periphyton, *Rivers, *Benthos, *Diatoms, Sewage effluents, Nitrogen, Dissolved oxygen, Water chemistry, Standing crop, Phosphorus compounds, Nutrients, Eutrophication, Silica, Water temperature, Phytoplankton, Primary productivity, Stratification, Turbulence, Light penetration, Retention, Hydrology, Cores, Organic matter, Varieties, Specific conductivity, Assay, Washington.
Identifiers: *Spokane River(Wash.), *Long Lake(Wash.), Diversity index, Autotrophic index.

Primary sewage effluents from Spokane, Washington, affected benthic diatom abundance in the Spokane River. There were fewer species and the diversity index was less below the outfall. Nitzchia fonticola and N. palea abundance was high due to increased dissolved nitrogen level. Achnanthes was sensitive to dissolved oxygen concentrations. Diatoms abundance correlated significantly with orthophosphate concentrations. A mean autotrophic index increased below the outfall. Based on individual species abundance, mean diversity and autotrophic indices, and percentage similarities between stations, a station 3.2 km downstream was recovering. Long Lake was highly eutrophic and its tributaries showed that Spokane's sewage effluents were major nutrient sources. Inorganic nitrogen and orthophosphate concentrations increased below the outfall. Orthophosphate, nitrate nitrogen, silica, and temperature affected phytoplankton abundance. Seasonal phytoplankton periodicity depended primarily on stratification, turbulence, light penetration, and retention time. Sediment cores indicated that organic matter had stabilized before incorporation into sediments; nitrogen and phosphorus increase 1.4-fold while diatoms increased 7-fold. Sediment accumulation was 1 mm/year. Sediment vertical migration, leaching and internal phosphorus recycling will not greatly affect the reservoir's trophic status after secondary sewage treatment with phosphorus removal begin. Nutrient loading abatement, high season flushing rates, and preservation of sediment integrity should facilitate Long Lake's recovery. (Buchanan-Davidson--Wisconsin).
W76-05468

MECHANICAL MANAGEMENT OF AQUAT VEGETATION: ANALYTICAL STUDIES UNIT OPERATIONS POTENTIALLY USEF IN THEIR PROCESSING,
Wisconsin Univ., Madison. Dept. of Mechani Engineering.
For primary bibliographic entry see Field 3B.
W76-05469

A PRELIMINARY REPORT ON T CONEWAGO CREEK FAUNAL SURVEY, L CASTER COUNTY, PENNSYLVANIA,
York Coll., Pa.
J. W. Stambaugh, and R. B. Denoncourt.
Proceedings Pennsylvania Academy of Scien Vol. 48, p. 55-60, 1974. 2 fig., 3 tab., 3 ref.

Descriptors: *Invertebrates, *Baseline stud *Streams, *Fish, *Benthic fauna, Pennsylva Surveys, Water temperature, Physical propert Hydrogen ion concentration, Varieties.
Identifiers: *Conewago Creek(Penn.), Spe diversity index.

Baseline data on fish and macroinvertebrates collected at ConewagCreek, Pennsylvania, determine the extent of impact that may be posed on the stream by proposed urban development. Thirty-three species of fish (specimens) were collected from July November 1973. The most common species fo at all collecting stations were Notropis spilopte N. procne, Lepomis auritus, N. hudsonius, N. nutus, N. amoenus, Etheostoma olms Nocomis micropogon, Catostomus commers and Pimephales, notatus. A total of 27 tax benthic macroinvertebrates were found; in nu ical order, the most predominant Hydropsyche, Baetidae, Heptageni Periodidae, Orconectes, Zygoptera, Corixidae midae, Tipulidae, and Tendipedidae. The m and ranges of the species diversity indices macroinvertebrates showed no obvious trends dices for fish showed a decreasing trend fron

ream to downstream sites. A comparison of iversity indices for fishes and macroinvertebrates iggests less stability for fishes. The macroinvertbrate species diversity indices at all stations on onewago Creek indicated moderate pollution. ater and air temperatures, oxygen and carbon oxide concentrations, hydrogen ion concentraon, and hardness were also recorded. (Buchananavidson-Wisconsin).
76-05470

RIMARY PRODUCTION STUDIES ON A NEW ESERVOIR: BIGHORN LAKE-YELLOWTAIL AM, MONTANA, U.S.A.,
astern Washington State Coll., Cheney. Dept. of ology.
A. Soltero, and J. C. Wright.
eshwater Biology, Vol. 5, No. 5, p. 407-421, 75. 6 fig., 5 tab., 41 ref.

escriptors: *Primary productivity, *Water emistry, *Reservoirs, *Limnology, Montana, trogen, Water temperature, Phosphates, ecific conductivity, Phytoplankton, Diatoms, anding crops, Cyanophyta, Dinoflagellates, lorophyll, Euphotic zone, Light penetration.
entifiers: *Bighorn Lake(Mont.), *Yellowtail m(Mont.), Bacillariophyceae.

mnological studies of the newly impounded ghorn Lake were conducted during 1968 to 1970 determine if a decline would occur in primary oductivity and to relate changes in primary oduction to the physical and chemical environnt. Total inorganic nitrogen (primarily nitrate rogen), orthophosphate, iron, manganese, and c were kusually higher at the influx of the ghorn and Shoshone Rivers. Bacillariophyceae re the dominant class of phytoplankton. Algal ccession was the same all three years with a ge part of the diatom standing crop in the spring l early summer, followed by flagellates, blueen algae, and another diatom maxima in the . Chlorophyll concentrations followed ytoplankton volumes. Volume-based ytoplankton density and chlorophyll concentran decreased down-reservoir. The euphotic zone pth increased down-reservoir as silt settled out, sequently euphotic zone standing crops were atest at mid-reservoir. Insufficient light ietration was the principal limiting factor to pri-y production in the upper reservoir. Decreased mary production in the lower reservoir did not m to be due to nutrient limitation. Bighorn ke was classified as moderately productive. mparison of sampling periods showed that the mated net primary production increased 84%, an total phytoplankton standing crop 44%, and an chlorophyll concentration 49% in 1970 over 8. (Buchanan-Davidson--Wisconsin).
6-05471

ILIZATION OF ALGAL ASSAYS TO ASSESS E EFFECTS OF MUNICIPAL, INDUSTRIAL, D AGRICULTURAL WASTEWATER EFJENTS UPON PHYTOPLANKTON PRODUCN IN THE SNAKE RIVER SYSTEM,
ific Northwest Environmental Research Lab., vallis, Oreg.
Greene, W. E. Miller, T. Shiroyama, and T. laloney.
er, Air, and Soil Pollution, Vol. 4, No. 3-4, p. 434, 1975. 11 fig., 3 tab., 9 ref.

criptors: *Bioassay, *Water pollution effects, ste water(Pollution), *Rivers, ytoplankton, *Eutrophication, Trophic level, bition, Washington, Oregon, Idaho, Nitrogen, sphorus, Productivity, Pacific Northwest , Nutrients, Toxins, Sampling, Forecasting, iting factors.
tifiers: *Algal assay procedure, *Snake River thwest U.S.), Selenastrum capricornutum.

ssive aquatic growth and algal blooms are the characteristic water quality problems in the Snake River Basin in Washington, Oregon, and Idaho. Correlation was high between expected trophic state and algal assay productivity response. No correlation was observed between increase of calcium, magnesium, alkalinity, and carbon content with maximum Selenastrum capricornutum yield. Phosphorus was growth-limiting in 45% of the samples and nitrogen in 33%. Phosphorus limitation decreased with increased productivity, therefore river waters with high orthophosphorus concentrations are more likely to become algal growth limited by nitrogen or other essential nutrient. In the presence of other essential elements, absence of toxicants, and not less than 0.010 mg orthophosphorus/1, each 0.001 mg orthophosphorus/1 will yield 0.430 mg dry wt S. capricornutum/1. In the presence of other essential nutrients and absence of toxicants, 0.001 mg total soluble inorganic nitrogen/1 will yield 0.038 mg/dry weight S. capricornutum/1. High correlation between predicted and actual yields was found in samples limited for algal growth by phosphorus or nitrogen. Coefficients plus nutrient additions to samples can be used to check accuracy of nitrogen and phosphorus analyses. Same samples inhibited yields during log phase of growth indicating presence of toxicants. Sampling techniques are discussed. (Buchanan-Davidson--Wisconsin).
W76-05472

UPTAKE OF ZINC AND STRONTIUM BY BROWN ALGAE,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
O. Skipnes, T. Roald, and A. Haug.
Physiologia Plantarum, Vol. 34, No. 4, p. 314-320, 1975. 9 fig., 1 tab., 11 ref.

Descriptors: *Phaeophyta, *Zinc, *Absorption, *Strontium, Marine algae, Cations, Cytological studies, Plant physiology, Radioisotopes, Algae.
Identifiers: *Ascophyllum nodosum, Desorbtion.

Accumulation of radioactively-labelled strontium and zinc in living and killed tips of the brown alga Ascophyllum nodosum was studied. Strontium accumulation was reversible, rapid and similar in living and killed plants. Therefore brown algae might be used to indicate pollution with strontium isotopes. A small part of zinc uptake by living algae and strontium accumulation by both living and dead algae seemed due to an ion-exchange process with intercellular polysaccharides. Zinc uptake by living algae was constant, slow, irreversible, and persisted for a long time. Uptake by dead algae was rapid and reversible, indicating that zinc-binding substances were not directly accessible to zinc in seawater before killing. In living plants, these substances may be in membrane-surrounded structures which regulate zinc uptake by living cells but are destroyed when algae are killed, making zinc-binding substances accessible. Zinc transfer from reversible intercellular sites to irreversible sites continued undistured during low--tide periods. Intercellular charged polysaccharides functioned as ion buffers, allowing ion uptake into cells at a constant rate, independent of tides. Zinc mainly accumulated near the surface of living A. nodosum tips. The nature of zinc-binding substances is unknown. Polyphenols in vacuoles may have high selectivity for many transition elements compared to major sea-water cations. (Buchanan-Davidson--Wisconsin).
W76-05473

SOME PHYSICAL FACTORS AS THE ECOLOGICAL BACKGROUND IN THE PELAGIAL OF THE SOSNOWICKIE LAKES,
Warsaw Univ. (Poland). Zaklad Microbiologica Wody Sci.
K. Matusiak, and I. Wojciechowski.
Acta Hydrobiologica, Vol. 17, No. 2, p. 102-139, 1975. 16 fig, 8 tab, 29 ref.

Descriptors: *Lake morphology, *Trophic level, Oxygenation, Dystrophy, Light intensity, Light penetration, Thermal stratification, Irradiation, Color, Deep water, Europe, Lakes.
Identifiers: *Poland, Lake Biale Sosnowickie(Poland), Lake Bialskie(Poland), Lake Czarne Sosnowickie(Poland).

Temperature, oxygen, and light studies of Lakes Biale Sosnowickie, Bialskie, and Czarne Sosnowickie in the Leczynssko-Wlodawskie Lake District, Poland, from 1961-1966 showed that these lakes differed from other Polish lakes, principally because of their high potential fertility with gradually increasing dystrophy. Thermal stratification was observed in the summer: Lakes Bialskie and Czarne were holomictic (dimictic) and Lake Biale polymictic. In Lake Biale there were frequently large changes in oxygen; however the lower layers always contained less oxygen and upper and middle layers were often oxygen supersaturaged. Hypolimnetic waters of Lakes Bialskie and Czarne were only oxygenated during spring and autumn. The vertical oxygen content corresponded to the thermal stratification. Hydrogen sulfide was detected occasionally. Transparency and light transmission were highest in Lake Bialskie and lowest in Lake Biale Sosnowickie. Lake Bialskie's euphotic zone was thickest; it was usually shallower in Lake Biale. Correlations between water transparency, water transmission, and compensation depth under ice-snow cover depended on snow thickness and qualitative state. Surface irradiation values and water color were also noted. In 1964, Wieprz-Krzna Canals lowered groundwater levels, dried up peat bogs, limited inflow of humus materials into the lakes, and inhibited dystrophication. (Buchanan-Davidson--Wisconsin).
W76-05474

DISTRIBUTION OF METALS IN LAKE SEDIMENTS OF THE ADIRONDACK REGION OF NEW YORK STATE,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
S. L. Williams, D. B. Aulenbach, and N. L. Clesceri.
FWI Report 75-11, 1975. 16 p, 1 fig., 4 tab., 9 ref.

Descriptors: *Lake sediments, *Metals, *Distribution, New York, Cadmium, Chromium, Cobalt, Copper, Nickel, Zinc, Cores, Lithification, Watersheds(Basins), Lake morphology, Trophic level, Surface waters, Hardness(Water), Water pollution.
Identifiers: Ticonderoga Bay(NY), Saratoga Lake(NY), Lake Champlain(NY), Lake George(NY), Crystal Lake(NY), Second Lake(NY), Lake of the Pines(NY), Bass Lake(NY).

To correlate metal concentrations in sediments with lake parameters, cadmium, cobalt, chromium, copper, nickel, and zinc were determined in several levels of sediment cores and the overlying water of seven lakes and Ticonderoga Bay in the vicinity of Adirondack Park in upper New York State. Metal concentration differences were evaluated in respect to location in the cores, drainage basins lithology, geographic location, and trophic state. Each parameter had an effect on one or more of the metals in the sediments. Although there is generally no direct relation between metals and the lake's trophic state, there seemed to be a relation between specific metals and the trophic states. Results indicated that hardness was important. Cadmium, cobalt, and chromium showed a general increase with trophic state, ranging from oligotrophic to eutrophic. Zinc, with the exception of Ticonderoga Bay, showed lower concentrations. Except for Ticonderoga Bay, copper and nickel concentrations showed no definite trends. Areas like Ticonderoga Bay, which is polluted by industrial wastes, may show varying metal concentrations in overlying waters and sediments, depending on metals discharged in wastes. Sediment

surfaces generally had higher concentrations of all metals than sediments about 0.5 m deep, suggesting sedimentation of metals increased over the years. (Buchanan-Davidson--Wisconsin).
W76-05475

ANALYSIS OF SULFUR-CONTAINING PRODUCTS ACCUMULATED BY CHLORELLA MUTANTS,
Leningrad State Univ. (USSR). Inst. of Nuclear Physics.
I. E. Kamchatova, L. M. Gracheva, K. V. Kvitko, V. G. Korolev, and B. T. Mukhmadiev.
Soviet Plant Physiology, Vol. 22, No. 1, p. 120-124, 1975. 2 fig, 1 tab, 11 ref.

Descriptors: *Cytological studies, *Sulfur, *Absorption, *Sulfur compounds, *Chlorella, Kinetics, Peptides, Cultures, Microbiology, Separation techniques, Amino acids.
Identifiers: Autolysis, Cysteine, Cysteic acid, Cysteine sulfinic acid.

The kinetics of sulfur disappearance from the culture medium and the presence of sulfur in cells of a wild strain of Chlorella vulgaris and 'feeder' mutants obtained from this strain by X-ray irradiation were studied, using sulfur-35 as a label. The sulfur-containing products which were accumulated by these strains were compared by paper chromatographic methods. The best solvents for separation of sulfur-containing compounds were determined. Cells of mutant strains accumulated greater amounts of cysteine than cells of the wild strain. Radioactive sulfur was detected in peptides and proteins of the autolysate of cells of the wild strain. In autolysates of cells of the mutant strains, cysteine, cysteic acid, and cysteine sulfinic acid were also detected. Cysteine accumulated primarily in the form of low molecular weight peptides. It is hypothesized that mutation injured the regulation of cysteine synthesis. Cysteine accumulated and perhaps combined with other amino acids to form peptides by a pathway not mediated by synthesis on ribosomes. These peptides may stimulate synthesis of excess cysteine and incorporation of cysteine into peptides. A hypothesis is presented to explain the mechanism that determines the 'feeder' trait. The pathways for the microbiological synthesis of sulfur-35 labelled cysteine and other sulfur-containing compounds are discussed. (Buchanan-Davidson--Wisconsin)
W76-05476

DIFFUSION OF MINERAL IONS THROUGH THE WALL OF NITELLA CELLS,
Moscow State Univ. (USSR). Faculty of Biology and Soil.
B. N. Ivanov, G. A. Kurella, and L. G. Yaglova.
Soviet Plant Physiology, Vol. 22, No. 1, p. 102-106, 1975. 3 tab, 10 ref.

Descriptors: *Electrolytes, *Salts, *Cytological studies, *Algae, Cations, Anions, Diffusion, Permeability, Selectivity.
Identifiers: *Nitella flexilis, Potassium chloride, Sodium chloride, Lithium chloride, Ammonium chloride, Hydrochloric acid, Potassium nitrate, Potassium bicarbonate, Potassium dihydrogen phosphate, Potassium sulfate.

Membrane properties exhibited by isolated Nitella flexilis cell walls under conditions of increasing electrolyte concentration gradients through the wall were studied. Also the dependence of cell wall membrane properties on the nature of cations and anions and specific characteristics of diffusion of separate ions through the wall were measured using 0.1-0.0001 N solutions of potassium chloride, sodium chloride, lithium chloride, ammonium chloride, hydrochloric acid, potassium nitrate, potassium bicarbonate, potassium dihydrogen phosphate, and potassium sulfate. Selective permeability of walls for cations was weakly dependent on the nature of univalent ions and cations of the alkaline metals and ammonium. Cell wall selectivity was higher when bivalent anions were present in solutions of potassium sulfate; this was apparently determined by the low permeability of bivalent anions. Ratios of wall permeability coefficients for anions and cations and ratios of wall permeability coefficients for like ions calculated from concentration potential values indicated that differences in wall permeability for univalent ions under various conditions were influenced strongly under conditions of a considerable electrolyte concentration gradient by positive osmotic flux of water, electroosmotic flux of water, and structure and solvating capacity of water in the wall phase for onions). (Buchanan-Davidson-Wisconsin).
W76-05477

THE RELATIONSHIP BETWEEN SUBSTRATE CONTENT, WATER QUALITY, ACTINOMYCETES, AND MUSTY ODORS IN THE BROAD RIVER BASIN,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
R. L. Raschke.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-227 063, $5.00 in paper copy, $2.25 in microfiche. Report 03078, January 1973. 82 p. 20 fig, 25 tab, 27 ref.

Descriptors: *Municipal water, *Potable water, *Actinomycetes, *Water pollution effects, *Odor, Rivers, South Carolina, Nutrients, Spring, Organic matter, Air temperature, Water temperature, Rainfall, Streamflow, Runoff, Water treatment, Leaves, Industrial wastes, Municipal wastes, Textiles, Taste, Bottom sediments.
Identifiers: *Broad River(S. C.), Columbia(S. C.), Leaf litter.

Musty odors caused by actinomycetes are common in the Broad River, the water supply for Columbia, South Carolina. Actinomycete growth and odor appear dependent on influx and storage of organic matter and other nutrients, air and water temperature, rainfall, and streamflow during the spring. The major tributaries are the primary source of organic matter and other nutrients; canals and reservoirs act as nutrient sinks and provided substrates conducive to Actinomycete growth and odor production. Leaf litter odors were higher than water odors and increased as leaf litter wet weight decreased. Average stream substrate and leaf litter actinomycete counts increased during the study period. Leaf litter actinomycete counts were generally higher than in stream substrates and periphyton. It is suggested that a n odor panel should be established to sample odors upstream near Parr Dam in the spring. Water should promptly be treated with activated carbon when air and water temperatures of 17C or above occur during extended spring lowflow periods and upstream threshold odors are four or greater (conditions which can cause severe odor problems). Municipal and industrial waste inputs should be reduced as much as possible, especially from Lockhardt and Carlisle textile mills and discharge into tributary streams draining the Greenville-Spartansburg area. (Buchanan-Davidson--Wisconsin)
W76-05478

LIGHT-INDUCED TRANSFORMATIONS OF THE PIGMENT COMPLEX IN ANACYSTIS NIDULANS,
Akademiya Nauk SSSR, Moscow. Institut Biokhimii.
L. M. Vorobeva, A. A. Krasnovskii, and G. A. Kayupova.
Soviet Plant Physiology, Vol. 22, No. 1, p. 9-17, 1975. 8 fig, 25 ref.

Descriptors: *Phototropism, *Light, *Plant pigments, *Cyanophyta, *Chlorophyll, Algae, Photosynthesis, Fluorescence, Plant physiology, Oxygen, Wavelengths, Energy transfer.
Identifiers: Anacystis nidulans, Phycocyan.

Properties of different chlorophyll forms in the pigment complex of photosynthesizing organisms were studied by measuring spectral changes in Anacystis nidulans with growth time and light after cell breakdown. Spectra at -196C of one-day cells grown with low light showed 720 nm fluorescence maximum, low at 685 nm and 695 nm, and maximum phycocyan near 655 nm. After prolonged growth, the main maximum was at 685 nm and at 720 nm fluorescence was low. When one-day cells were illuminated at 30 C, maxima at 695 nm and 720 nm decreased and at 685 nm increased. Prolonged illumination caused chlorophyll fluorescence to decrease and shift from 685 nm to 675 nm due to photodestruction. Phycocyan fluorescence increased due to uncoupling of energy transfer to chloroplasts. In cells grown a long time, the 685 nm maximum did not increase following illumination. Light caused a decrease of fluorescence at 685 nm, and phycocyan fluorescence to increase after prolonged illumination. Without oxygen, long illumination was needed before spectral changes were observed; fluorescence at 695 nm and 685 nm did not decrease. Illuminating cells in air at 15 C, and subsequent dark storage at 30 C, indicated a photochemical reaction with oxygen and a reverse dark reaction which increased the short-wave form. Spectral changes during illumination of algae are due to changes in the pigment complex associated with reversible photooxidation of chlorophyll. (Buchanan-Davidson--Wisconsin).
W76-05479

ROLE OF CALCIUM CARBONATE PRECIPITATION IN LAKE METABOLISM,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W76-05480

5D. Waste Treatment Processes

ELECTROCHEMICAL REMOVAL OF FLUORIDE ION FROM AQUEOUS MEDIA,
Andco Inc., Buffalo, N.Y. (assignee)
S. K. Lee.
U.S. Patent No. 3,926,753, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 941, No 3, p 1318, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial water, *Water pollution control, *Ion exchange, Electrochemistry, Anodes, Cathodes, Separation techniques, *Fluorides, Aluminum.

The invention is applicable to the treatment of various liquids containing aluminum-precipitable, co-precipitatable or complex-forming impurities or toxicants, such as those liquids resulting from industrial metal finishing, chromate conversion coatings, chemical industries, paper mill effluents, sanitary and municipal sewage, aluminum manufacturing, etc. Brackish waters containing high fluoride and other toxic ions may also be treated by this method but primarily it is useful for removal of harmful ions such as fluorides. The method electrochemically removes from an ionizing medium a contaminant fluoride ion which is capable of forming an insoluble aluminum compound, complex or co-precipitate. An electric current is passed between an anode which has a surface or a portion of a surface of aluminum, aluminum alloy or insoluble aluminum compound and a cathode through the ionizing medium containing the ion to be removed, so as to produce anodically an insoluble aluminum compound, species or complex while cathodically reacting with the aqueous medium to generate hydrogen and produce hydroxyl ion to form insoluble products. Such insoluble materials are recovered from the aqueous medium. (Sinha-OEIS)
W76-05023

LECTROCHEMICAL CONTAMINANT EMOVAL FROM AQUEOUS MEDIA,
ndco Inc., Buffalo, N.Y. (assignee)
K. Lee.
.S. Patent No. 3,926,754, 9 p, 7 fig, 4 tab, 6 ref; fficial Gazette of the United States Patent Of-ce, Vol 941, No 3, p 1318, December 16, 1975.

escriptors: *Patents, *Waste water treatment, ndustrial wastes, Water pollution control, eparation techniques, *Electrochemistry, nodes, Cathodes, Iron, *Iron compounds, nromium, *Ions, Aqueous solutions.
entifiers: Cyanides.

method for electrochemically removing from an nizing medium a contaminant ion which is capa- e of forming an insoluble iron compound, com- ex or co-precipitate comprises passing an elec- c current between an anode which has a surface a portion of a surface of iron, iron alloy or in- luble iron compound, and a cathode, through the nizing medium containing the ion to be removed. insoluble iron compound, species or complex produced while cathodically reacting with the ntaminant ion, to form insoluble products, and noving such insoluble materials from the aque- s medium, or the contaminant, which is initially xic, is converted to non-toxic or less toxic form ich is insoluble and is removed. The invention is plicable to the treatment of various liquids con- ning iron-precipitatable, co-precipitatable or mplex-forming impurities or toxicants, such as se liquids resulting from cooling tower opera- ns, chromate conversion coatings, metal finish- industries, paper mill effluents, sanitary and nicipal sewage, etc. Brackish waters may also treated by this method but primarily it is useful removal of toxicants such as hexavalent romium, cyanide and other such materials from ste streams so as to avoid contamination of the ters into which such discharges ultimately flow. nha-OEIS)
76-05024

OCESS FOR RECOVERING TIN SALTS OM THE WASTE RINSE WATER OF A LOGEN TIN PLATING PROCESS,
Metals and Chemicals, Inc., Pittsburgh, Pa. signee)
E. Horn, and D. W. Grenda.
S. Patent No. 3,926,759, 6 p, 3 fig, 2 tab, 6 ref; icial Gazette of the United States Patent Of-, Vol 941, No 3, p 1319-1320, December 16, 5.

scriptors: *Patents, *Waste water treatment, dustrial wastes, Water pollution control, uorides, Filtration, Separation techniques, Ion sport, *Electrodialysis, Reverse osmosis, mbranes, Metals, Salts.
ntifiers: *Tin-plating industry wastes, Metal overy, Tin salts.

rocess for recovering the tin and fluoride units n waste rinse water in an approximate concen- on and ratio suitable for use in a halogen plat- bath includes first filtering the waste rinse er to remove insoluble materials and then treat- he filtered rinse water to remove residual or- c compounds. The treated rinse water is then oduced into a depletion compartment of an trodialytic cell where the excess fluorides are oved by migrating through an anionic mem- e into an adjacent compartment. When a suffi- amount of the fluoride units have been oved from the rinse water by electrodialysis so the mole ratio of fluoride to tin is suitable for in a plating bath the rectified rinse water is oved from the electrodialytic cell and is con- rated by electrodialysis or reverse osmosis to a solution having the approximate concentra- of the plating bath. The fluorides are removed the compartment adjacent the depletion com- ment and are reacted with sodium hydroxide rm a bifluoride for use in the rinse water. With arrangement the tin and fluoride salts are recovered from the rinse water and utilized in the tin plating bath and the fluoride units are also used as a bifluoride in the rinse water. The depleted water is drawn off for reuse. (Sinha-OEIS)
W76-05025

WARM SLUDGE DIGESTION WITH OXYGEN,
Union Carbide Corp., New York. (assignee)
N. P. Wahidieck.
U.S. Patent No. 3,926,794, 13 p, 17 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1330, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, Water pollution control, *Sludge treatment, *Biochemical oxygen demand, *Activated sludge, *Aeration, Oxygen, *Sludge digestion, Mixing, Heating.

A method is disclosed for BOD-removal from wastewater in a covered aeration zone and activated sludge digestion in a covered digestion zone by aeration with oxygen gas. First gas comprising at least 40% oxygen is introduced into the covered aeration zone where it forms gas which is mixed with the wastewater and recycled sludge in the covered aeration zone and one of the fluids in such zone is simultaneously, continuously recirculated against the other fluid in sufficient quantity and rate to maintain the dissolved oxygen content of the mixed liquor. The mixed liquor is separated into purified liquid and activated sludge, and unconsumed oxygen-containing gas is discharged from the aeration zone at rate such that its oxygen content is no more than 40% of the total oxygen introduced to the digestion zone. Part of the activated sludge is then returned to the aeration zone as recycled sludge. Second gas comprising at least 80% oxygen and sufficient in quantity to provide part of the first gas is introduced along with the unreturned activated sludge to the enclosed digestion zone. They are mixed and one of the fluids simultaneously recirculated against the other fluid in the digestion zone. During this step, the sludge is maintained at temperatures of at least 25 deg C and at least 10 deg C warmer than the wastewater aeration zone liquor temperature, but below 75 deg C. The digestion zone mixing and fluid recirculation are continued for sufficient duration to oxidize at least 60% of the biodegradable volatile suspended solids content of the sludge introduced to the digestion zone. (Sinha-OEIS)
W76-05026

BIOLOGICAL TREATMENT OF PLANT WASTE STREAMS TO REMOVE CYANURIC ACID,
FMC Corporation, Philadelphia, Pa. (Assignee).
J. Saldick.
U.S. Patent No. 3,926,795, 6 p, 1 fig, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1331, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Domestic wastes, *Industrial wastes, Water pollution treatment, Water pollution control, Anaerobic conditions, Hydrolysis, Temperature, Chlorine, Ammonia, Carbon dioxide, Activated sludge, Hydrogen ion concentration, *Biological treatment.
Identifiers: *Cyanuric acid removal.

Cyanuric acid, present along with chlorides and sulfates in aqueous effluents from cyanuric acid chlorinated cyanuric acid processes can be broken down by hydrolysis into C02 and ammonia by treatment with bacteria derived from raw sewage, activated sludges from sewage plants, natural waters or soils, at temperatures below 50 deg C, provided that anaerobic or close to anaerobic conditions prevail in at least a portion of the biomass in the system, nutrient for the bacteria is fed to the system, and the system is maintained at a pH close to neutral (about 5.0 to 8.5). After breakdown of the cyanuric acid to C02 and ammonia, the system can be nitrified with air in known manner, biologically denitrified in known manner, then oxidized with air to remove its residual biological oxygen demand, clarified and discharged. The sludge from the system can then be used as source of bacteria in the primary hydrolysis. (Sinha-OEIS)
W76-05027

PREPARATION OF ACTIVATED SLUDGE AND TREATMENT OF WASTE WATER THEREWITH,
Nippon Gohsei Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
Y. Fujita, I. Kawasaki, and N. Hideo.
U.S. Patent No. 3,926,796, 6 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1331, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water pollution control, Organic compounds, *Activated sludge, *Chemical oxygen demand, Water pollution sources, Resins, *Decomposing organic matter.
Identifiers: *Polyvinyl alcohol resins decomposition.

Although activated sludge can assimilate polyvinyl alcohol resins, the rate of assimilation is very slow. This invention describes a process for preparing activated sludge so that it will decompose polyvinyl alcohol more efficiently. The acclimation of an ordinary activated sludge is carried out in an aqueous solution including a polyvinyl alcohol resin and at least one nutrient in the range of bio-chemical oxygen demand. When a comparatively low activity is sufficient for the activated sludge to treat a waste water, the acclimation is carried out under a low loading of the polyvinyl alcohol resin and completed at the time the COD of the aqueous solution decreases to less than 15% of the initial one. When the high activity is desired, the acclimation is carried out stepwise by increasing stepwise the amount of polyvinyl alcohol resin from less amount to more amount within the above-mentioned range every 85% or more drop of the COD of the aqueous solution. COD is determined by potassium permanganate method. The activated sludge employed in the invention is not limited. Any known activated sludge used in sewage treatment plant or waste water treatments from textile plant, chemical plant and food plant can be employed. Nutrients employed are potassium acetate, sodium acetate, or ammonium acetate in a mixture or alone. (Sinha-OEIS)
W76-05028

REVERSE OSMOSIS MEMBRANE,
Department of the Interior, Washington, D.C. Office of the Secretary.
For primary bibliographic entry see Field 3A.
W76-05029

METHYLENE PHOSPHONATES OF GLYCIDYL REACTED POLYALKYLENE POLYAMINES AND USE IN SCALE AND CHELATION,
Petrolite Corp., St. Louis, Mo. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05030

METHOD FOR REMOVING BOTH ORGANIC MATTER AND BACTERIA FROM A BODY OF WATER,
Water Science, Inc., Calif. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05031

CYANIDE ENHANCEMENT OF THE PHOTOOXIDATION OF ACETIC ACID,
Dow Chemical U.S.A., Midland, Mich. (Assignee).
C. B. Murchison.
U.S. Patent No. 3,926,803, 3 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No. 3, p 1332-1333, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, Water pollution control, *Industrial wastes, Separation techniques, Ionization, Ions, Oxidation, Chemical reactions, Aqueous solutions.
Identifiers: *Photooxidation, *Cyanide ions, Ferric ions, *Acetic acid.

Aqueous solutions containing oxidizable carboxylic acids such as waste streams which come from chemical plants, distilleries, smelters, sewage systems and the like can be treated to oxidize the organics contained in them and correspondingly reduce the chemical, biochemical and total oxygen demand of the liquor. The process can be used in conjunction with other known waste treatment processes if desired. The process is more efficient when substantially all the reactants are dissolved in the aqueous liquor. However, some solid organics can be oxidized by the process. Classes of organic materials the photooxidation of which is further catalyzed by the addition of cyanide ions include aliphatic and aromatic carboxylic acids, e.g. formic, acetic, propionic, 2,4-dichlorophenoxyacetic, chloropropionic, glycolic, chloroacetic, lactic, butyric acids and the like. Acetic acid is particularly beneficially oxidized by this method. To an aqueous solution containing one or more carboxylic acids and a catalytic quantity of ferric ions is added an amount of cyanide ions sufficient to provide a mole ratio of cyanide ions to ferric ions in the solution of at least about 5:1. The solution is maintained at pH of 4 or less, treated with 02, and subjected to light waves ranging in length from about 2000 A to about 5800 A. As a result C02 is released and the total organic carbon (TOC) level of the solution is reduced. (Sinha-OEIS)
W76-05032

DEVICE FOR THE CONTINUOUS TREATMENT OF LIQUID STREAMS,
Gesellschaft zur Wiederaufarbeitung von Kernbrennstoffen m.b.H., Leopoldshafen bei Karlsruhe (West Germany).
H. Evers, and W. Knoch.
U.S. Patent No. 3,926,807, 7 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1333, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Water treatment, *Demineralization, *Water softening, *Ion exchange, Water purification, Separation techniques, Sorption, Nuclear wastes, Byproducts, Beneficial use, Equipment.

Continuous treatment of a liquid stream is achieved by circulation with solids in a countercurrent flow. The device can be used both for cleaning of liquids, irrespective of the state of aggregation of the impurities contained in it, and for the generation of valuable substances from liquids irrespective of the form in which such valuable substances are present in such liquids. At the same time, the device can be used both for ion exchange processes with ion exchange material circulation and for sorption-desorption processes and enrichment and/or separation processes, respectively. The device which treats a liquid stream with solids circulated from top to bottom in a treatment column in countercurrent flow to the liquid stream comprises of: a treatment column with heating and cooling jacket; a first counter-pressure chamber connected to the bottom of the treatment column for receiving washed and loaded solids from the treatment column; a regeneration column for regenerating the solids used in the treatment column; a second counterpressure chamber connected to the bottom of the regeneration column for receiving regenerated solids from the regeneration column; a first valveless connection line connecting the outlet for regenerated solids at the bottom end of the counterpressure chamber of the regeneration column with the inlet for solids at the top of the treatment column; and a second valveless connection line connecting the outlet for removing solids at the bottom end of the counterpressure chamber of the treatment column with the inlet for the loaded and washed solids at the top of the regeneration column. (Sinha-OEIS)
W76-05033

SEWAGE TREATMENT SYSTEM,
C. C. Goddard.
U.S. Patent No. 3,926,808, 3 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1334, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, *Aeration, *Aerobic bacteria, Solar radiation, Water reuse, Irrigation water, Reclaimed water.

This sewage treatment system proposes oxidation through aeration, aerobic bacterial action on nutritional matter and the natural effects of ultraviolet rays emitted by the sun. Raw sewage effluent is released into recirculation aeration channels with impervious linings and is seeded with aerobic bacteria. Part of the effluent is diverted to a recirculating sump from which it is pumped through a venturi tube asperating device thus adding air to the incoming sewage. In addition it is seeded with aerobic bacteria and diluted with clarified water from the final effluent aeration channel. The effluent passes over a wier protected by a scum skimmer, through a discharge trough, either to natural drainage or into a collecting tank reservoir for use in irrigation or lawn sprinkler operation. Fresh water may be injected into the system, preferably at the recirculation sump, if the sewage effluent is insufficient to provide for necessary intermittent irrigation. (Sinha-OEIS)
W76-05034

APPARATUS FOR THE AERATION OF EFFLUENT WITH OXYGEN-CONTAINING GAS,
Hoeschst A.G., Frankfurt am Main (West Germany) (Assignee)
H. Gudernatsch, G. Jaekel, W. Kroll, V. Oden, and K. Reinhardt.
U.S. Patent No. 3,926,810, 3 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1335, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Water pollution control, Water purification, *Aeration, Oxygen, Equipment, Bubbles.

Effluent is aerated with oxygen containing gas in an aeration basin. The basin is composed of a number of aeration boxes placed parallel to each other, spaced apart from each other and connected to each other by a manifold. The aeration boxes have flattened horizontal upper sides penetrated by a number of gas outlets. The aeration boxes have a rectangular cross-section area and terminal surface areas. The boxes are made of plastic material and are open at the bottom. Each of the gas outlets is provided from below with a central counterbore which prevents activated sludge from caking together in the region of the gas outlets and ensures an optimum passage of oxygen from the gas to the effluent in fine bubbles. (Sinha-OEIS)
W76-05035

READILY ATTACHABLE WATER FILTER WITH CUTOFF VALVE,
Aqua-Chem, Inc., Milwaukee, Wis. (assignee)
For primary bibliographic entry see Field 8C.
W76-05038

THE COSTS OF BIOLOGICAL WASTE WATER TREATMENT (DIE KOSTEN DER BIOLOGISCHEN ABWASSERREINIGUNG),
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
J. Negaard.
Dissertation No. 5335, Eidgenoessischen Technischen Hochschule Zuerich, Zurich, Switzerland, 1975. 175 p, 45 fig, 12 tab.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Construction costs, *Biological treatment, Statistical methods, *Cost analysis, Operating costs, Analytical techniques, Regression analysis.
Identifiers: Switzerland.

Data were collected from 50 Swiss sewage treatment plants. An analysis of these data showed functional relationships between construction and operating costs. For various types of costs, the simultaneous effects of important parameters were determined by multiple regression techniques. This proved to be more reliable than previous research involving only a single parameter. Results of the cost analyses are presented in several tables and graphs. (Kramer-FIRL)
W76-05044

PHOSPHORUS MOVEMENT IN SOILS: THEORETICAL ASPECTS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-05048

A SUPPLEMENTAL SOCIO-ENVIRONMENTAL DECISION TOOL: VALUE CONFLICTS ON LONG ISLAND,
Weston (Roy F.) Inc., Roslyn, N.Y.
K. J. Phillips.
Journal of Environmental Systems, Vol. 5, No. 2, p 103-113, 1975. 1 fig, 1 tab, 11 ref.

Descriptors: *Groundwater, *Recharge, *Sewers, *Septic tanks, *Water quality control, Nitrates, Planning, Environmental effects, Costs, Public Health, Waste disposal, Sewage treatment, Municipal wastes, *New York, *Artificial recharge.
Identifiers: Value conflicts, *Long Island(NY).

The groundwater quality of Long Island, New York, has deteriorated due to the cumulative effects of recharge through cesspools and septic tanks. In particular, increasing concentrations of nitrates have been measured at levels of up to twice the accepted health standards. To alleviate these conditions, a plan of replacing the individual waste disposal systems with se is being implemented. This paper focussed on value conflicts expected from the environmental impacts of the sewering plan. Values involving economics (costs of sewers and treatment facilities) and inconvenience and aesthetics (excavation, rerouting and detouring of streets) are juxtaposed with the values of health and convenience with the advent of an odor free and dependable waste disposal system. (Kramer-FIRL)
W76-05049

THE RATE OF PSYCHROPHILIC AND MESOPHILIC BACTERIA IN DIFFERENTLY POLLUTED WATERS OF BUDAPEST (A PSYCHROPHIL ES A MESOPHIL BAKTERIUMOK SZAMANAK ARANYA KUELOENBOEZOE SZENNYEZETTSEGII BUDAPESTI VIZEKBEN),
For primary bibliographic entry see Field 5A.
W76-05053

INVESTIGATIONS ON THE MICROBIAL REDUCTION OF SULPHATES,
Adam Mickiewicz Univ., Poznzn (Poland). Inst. of Geography.
F. Domka, and J. Gasiorek.
Acta Microbiologica Polonica, Ser. B., Vol. 7, No. 1, p 61-72, 1975. 11 fig, 3 tab, 13 ref.

Descriptors: Kinetics, *Sulfates, *Microorganisms, *Microbial degradation, Sulfur, Equations, Analytical techniques, *Waste water treatment, Industrial water.

kinetics of the microbiological reduction of ates have been investigated. The reduction was ied out by Desulfovibrio. Microbial reduction ulfates may be applied for industrial purposes, uding the use of phosphogypsum, gypsum, or ydrite wastes as raw materials for sulfur or sul- acid production. Sewage sludge, enriched calcium sulfate, may also be utilized. In this r, optimal conditions were defined for the tion and were found to be at 35 degrees and 7. The reaction order, kinetics equation, and effects of the temperature and pH of the medi- on the conversion of sulfate to sulfide were presented. (Kramer-FIRL)
-05054

TER WORKS PLANT STATISTICS.
primary bibliographic entry see Field 5F.
-05055

ATURATED FLOW DURING SOIL TREAT- IT OF SEPTIC TANK EFFLUENT,
Survey Inst., Wageningen. (Netherlands)
primary bibliographic entry see Field 5B.
-05058

ANCING AND MANAGEMENT OF THE POSED SEWERAGE SCHEME FOR UR TOWN,
r Public Health Engineering Dept. (India).
ing Circle.
Kachwaha.
al of the Institute of Engineering (India), 55, Part PH3, p73-75, June, 1975. 2 tab, ap-

riptors: *Sewerage, *Sewers, *Financing, agement, Capital, Municipal wastes, Costs.
ifiers: Jaipur City(India), *India.

proposed sewerage scheme for Jaipur City, is discussed. In 1963-64, a scheme was ned for 610,000 people at a cost of Rs 2.04 s. Since this has already been surpassed, a cheme has been designed for the estimated population, 12.5 hundred thousand people, at cost of Rs 14.95 crores. It is assumed that as sewer connections will be needed as there ater connections. It is hoped that unsewered sidents would accept a sewer connection at e of Rs 450, since the costs of soak pits and tanks are more and these provide only tem- relief. It is desirable to levy development es on existing plots for providing sewerage ns. Considering estimates of residential land l, this can produce capital receipts of over million. Capital receipts from commercial dustrial land are estimated at Rs 47 million. dering population and sewer increases by connection charges will result in almost Rs ion in capital receipts. It is proposed that the Health Engineering Department of the will run, maintain, and manage the cted scheme.The scheme is proposed to be cted by 1979-80. New sewer connections spread out over the years at an average of 3,350 per year. It is concluded that the e would not only be viable but would also be pporting. (Pinto-FIRL)
5062

LYZED PROCESS AND CATALYST VERY,
Drug, Inc., New York. (Assignee).
ly, E. M. Pogainis, and C. A. Hoffman.
States Patent 3,912,626. Issued October 14,
fficial Gazette of the United States Patent Vol. 939, No. 2, p 931-932, October, 1975.

tors: *Patents, *Waste water treatment, tion, *Chemical precipitation, *Separation ues, *Solids removal, Suspended solids, sts.
ers: Cupric ion, Silver ion, Wet oxidation.

A patent has been issued for a method of waste water treatment by wet oxidation. The oxidation is performed at a temperature between 150 and 340 C and a pressure between 200 and 4000 psi in the presence of either cupric or silver ion in a concentration between 10 and 10,000 mg/liter. The resulting oxidized waste water is subjected to liquid-solid separation to remove non-catalytic suspended solids. The liquid phase is then treated with a source of sulfide ions which reacts with the cupric or silver ion, forming an insoluble precipitate containing cupric or silver sulfide. The precipitate is then separated from the liquid phase and reintroduced into the wet oxidation reactor. Thus, silver or cupric ions are regenerated for the catalysis of additional waste water. (Kramer-FIRL)
W76-05064

THE USE OF ADENOSINE TRIPHOSPHATE MEASUREMENTS IN THE CONTROL OF THE ACTIVATED SLUDGE PROCESS BY THE SOLIDS RETENTION TIME METHOD,
University Coll., Cardiff (Wales). Dept. of Microbiology.
M. Statham, and D. Langton.
Process Biochemistry, Vol. 10, No. 8, p 25-28, October, 1975. 6 fig, 4 tab, 12 ref.

Descriptors: *Activated sludge, *Sludge treatment, *Waste water treatment, Biochemical oxygen demand, Treatment facilities, Flow rates, Suspended solids, Microorganisms, *Pollutant identification.
Identifiers: *Adenosine triphosphate, *Solids retention time, Mixed liquor suspended solids, Sludge volume index.

Successful operation of the activated sludge process requires that the sldge settle quickly or the quality of the final effluent will be severely reduced. Experiences in the control of an activated sludge plant are described. Some problems that have arisen in the control of the plant being studied are: it must be run as two lanes of four aeration pockets; it is impossible to operate at a recycle ratio of less than 0.6; and surface water infiltrates into the sewerage system. In an attempt to control the plant, observations were made of biochemical oxygen demand (BOD), Lflow rate, recycle rate, wastage rate, mixed liquor suspended solids (MLSS), sludge volume index (SYI), and a relatively novel parameter, the adenosine triphosphate concentration (ATP). The theory of solids retention time (SRT) is discussed. For the sludge to have good settling characteristics, the food to microorganism ratio must be kept within certain limits. A model is described that relates microorganism growth to this ratio or loading factor to calculate the sludge wastage rate. The method developed of SRT control requires only flow data and no laboratory work. ATP extraction procedures and measurement techniques are described. Standard techniques were used to measure MLSS, BOD, and SVI. Results show that for SVI values lower than 250, ATP concentration is related to SVI. SRT's of six to nine days should be avoided in the plant studied. For the best BOD removal efficiencies, higher SRT's are required. The SRT method of control is strongly recommended. (Pinto-FIRL)
W76-05065

SEWAGE AS A RESOURCE,
Wessex Water Authority, Bristol (England). Operations Directorate.
J. Coldrick.
New Scientist, Vol. 68, No. 973, p 276-278, October 30, 1975.

Descriptors: *Sewage, *Sewage treatment, *Waste water treatment, Sewage disposal, Waste water disposal, Sludge, Sludge digestion, Treatment, Disposal, Sewage effluents, Resources.
Identifiers: *Sewage utilization, *Sludge utilization, Sewage resources, Great Britain.

A large portion of the capital expenditure of Britain's Regional Water Authorities will be spent on new sewerage schemes or new sewer treatment facilities. The work of the Wessex Water Authority, which uses sewage as a resource, is discussed. Though there may be no universally applicable sewage treatment process, certain principles always apply. Sludges produced from primary treatment differ from sludges produced from secondary treatment. The sludge can be treated by anaerobic or aerobic digestion, heat treatment, air drying, or mechanical dewatering. The aim is to produce as cheaply as possible a residue that is non-toxic, non-polluting and inoffensive. Sea disposal is economic and can be of benefit to marine life. Application to agricultural land is particularly valuable. A small proportion of air dried sludge is sold as fertilizer and soil conditioner. In most cases, this sludge is given away to farmers. The sludge gas produced in the digestion process can be used as a source of energy. The possibility of using sludge gas for vehicular propulsion has been considered, but the scrubbing and compression costs make it a less attractive proposition. Sewage effluents can be used in cooling or quenching processes or in cement works where high grade water is not necessary. Sewage has been used in fish production in parts of Europe to good advantage. Another possibility is the growing of algae in sewage to reduce inorganic pollution. (Pinto-FIRL)
W76-05066

EXPERIMENTAL WORK ON THE SETTLEMENT OF SEWAGE,
T. Stones.
Effluent and Water Treatment Journal, Vol. 15, No. 10, p 529, 531, 533, 535, 537-541, October, 1975. 10 fig, 12 tab, 7 ref.

Descriptors: *Sewage, *Sewage treatment, *Waste water treatment, Chemical precipitation, Toxicity, *Biological treatment, Flocculation, Sedimentation, Aeration, Suspended solids.
Identifiers: Mechanical flocculation.

A review of the experimental work on the settlement of sewage is presented. Despite its chemical complexity, the constituents of sewage can be classified into four groups: large solids which can be removed by screening; coarse suspended solids which can be separated by sedimentation; finely dispersed solids which can be separated only after uniting into larger particles; and soluble solids. Biological sedimentation, pre-aeration, chemical precipitation, and mechanical flocculation are discussed. It has been shown that a greater amount of biological purification occurs during tank treatment than was previously thought. Toxic constituents may interfere with the sedimentation stage. It is concluded that tank treatment provides biological purification, settles the solids, and balances the fluctuations in strength in the incoming sewage. Pre-aeration has no effect on the character of the sewage after settlement and it does not promote the deposition of solids during settlement. It may help maintain aerobic conditions. Small dosages of lime and acid, added for chemical precipitation, may hinder purification because of the suppression of the biological purification that they may cause. Mechanical flocculation promotes good floc formation of coagulated matter, which then settles rapidly. However, it was found to be effective only when used in conjunction with a coagulating agent added for chemical precipitation. (Pinto-FIRL)
W76-05067

CIL TO TEST NEW SEWAGE UNIT.
Canadian Chemical Processing, Vol. 59, No. 10, p 32, 34, October, 1975. 1 fig.

Descriptors: *Sewage treatment, Sewage, *Waste water treatment, Effluents, Oxygen, *Treatment facilities.
Identifiers: *Deep shaft process, Henry's Law.

Canadian Industries Limited (CIL) has designed a deep shaft sewage treatment process that will handle biodegradable effluents at a lower energy input than the activated sludge process. The principal is based on a corollary of Henry's Law: the solubility of a gas in a liquid increases under pressure. A deep column allows more air absorption than do surface aerators. The process consists of a shaft a few hundred feet deep partitioned into two vertical sections. Screened, degritted sewage is pumped into the center column and mixes with an air stream and a biological culture. This provides oxygen and assures that the incoming fluid moves downward and the outgoing, aerated liquid moves upward. Estimates show that this system will require about 50 to 70% of the power used in the activated sludge process. Tests have shown that 90% of the oxygen in this process will undergo reaction, whereas in the activated sludge process, only 10% undergoes reaction. This means that less sludge and more carbon dioxide will be produced. The economics of oxygen enrichment do not look promising because of the increased solubility. Cryogenic oxygen was offered at 15 dollars per ton. Atmospheric oxygen could be fed into the system for 6 dollars per ton for small systems and 3 dollars per ton for large systems. (Pinto-FIRL)
W76-05068

FEASIBILITY OF HYDRAULIC TRANSPORT OF GROUND HOUSEHOLD REFUSE THROUGH SEWER APPURTENANCES,
Foster-Miller Associates, Inc., Waltham, Mass.
D. A. Monaghan, and A. R. Guzdar.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 915, $5.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-021, April, 1974. 138 p, 15 fig, 14 tab, 4 ref.

Descriptors: *Sewers, Wastes, *Waste disposal, *Solid wastes, Pipes, Hydraulics, Flow rates, Equipment, Cleaning, *Percolation.
Identifiers: Ground household refuse, Hydraulic transport.

The feasibility of hydraulic transport of ground refuse in conventionally designed sanitary sewers was investigated. Experiments were conducted on the gravity flow of ground household refuse through inverted siphons, running traps, bends, manholes, pump well inlets, lift stations, and obstacles. Evaluations were presented on: the minimum flow rate at which refuse slurry can be satisfactorily transported through the pipe system; the rates, types, and classes of materials deposited in the pipe system and its appurtenances; and design modifications needed to minimize deposition of material or other conditions leading to unsatisfactory flow. Results of laboratory investigations with an experimental test loop showed that the hydraulic transport of ground refuse at concentrations of up to 1.0% is feasible. However, at a refuse concentration of 1.5%, significant increases in pressure drop were noted. It was concluded that for flow velocities of 2.5 feet per second and above, any head losses become negligible. It was also found at steady state that heavy solids accumulate at specific locations with small increases of head loss but no danger of blockage. Periodic cleaning of the pipes was recommended to minimize the need for excessive scouring. (Kramer-FIRL)
W76-05070

USE OF ENVIRONMENTAL ANALYSES ON WASTEWATER FACILITIES BY LOCAL GOVERNMENT,
Teknekron, Inc., Washington, D.C. Applied Research Div.
J. C. Fensterstock, and D. M. Speaker.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 515, $5.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/5-74-015, July, 1974. 200 p, 10 fig, 7 append.

Descriptors: *Treatment facilities, *Decision making, *Federal jurisdiction, *State jurisdiction, *Waste water treatment, Analytical techniques, Legislation, Construction costs, Training, Environmental effects, Local governments.
Identifiers: Governmental funding.

The waste water treatment facility grant application process was analyzed as conducted at four case study sites: Jacksonville, Florida; Hot Springs, Arkansas; Nassau-Suffolk Counties, New York; and East Bay Municipal Utility District, California. Problems identified included: inadequate environmental orientation of the staffs, exclusion of lay public input, intra/inter-organizational conflicts, inadequate guidelines, and timing of environmental analyses for local consideration of consequences. It was found that environmental considerations played a relatively minor role in the decision-making process. Recommendations for local, state, and Federal implementation included: Federal funding to state and local agencies for training staffs, more precise Federal guidelines, legislative changes, and suggestions to increase public participation in the entire decision-making process. (Kramer-FIRL)
W76-05072

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W76-05073

AUDIOVISUAL INSTRUCTIONAL UNITS FOR WATER POLLUTION CONTROL TRAINING PROGRAMS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W76-05074

MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS, REFERENCES, REGULATIONS, GUIDANCE, PROCEDURES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
400 p. (1975).

Descriptors: *Regulations, *Legislation, *Federal Water Pollution Control Act, *Waste water treatment, Treatment facilities, Construction, Costs, Water quality control, Monitoring, Federal jurisdiction, Publications.
Identifiers: Construction grants program, Manuals.

This manual was published as an interim aid until the 'Construction Grants Manual' is issued (scheduled for 1976). This volume contains relevant program regulations, guidance, and technical information regarding the federal support of municipal waste water treatment facilities construction. Documents are grouped into six categories: construction grants and general grants; administration; provisions for environmental and social impacts and public participation; planning and state program assistance; permits and water quality monitoring; and other information. Legislation is detailed in copies of Federal Register articles. Several reference lists are also provided. (Kramer-FIRL)
W76-05075

WATER POLLUTION SURVEY, MOODY AIR FORCE BASE, GEORGIA,
Environmental Health Lab., Kelly AFB, Tex.
R. A. Virost.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-003 212, $5.25 in paper copy, $2.25 in microfiche. November, 1974. 121 p, 5 fig, 29 tab, 3 ref, 8 append.

Descriptors: *Sewage treatment, *Treatme facilities, *Water analysis, Waste disposal, Filte Water quality control, *Waste water treatme Separation techniques, Industrial wastes, On-s investigations, Water quality, Georgia.

An analysis has been made of the Moody AF Georgia, sewage treatment plant operating logs the period January to November 1973. On-site vestigations were also conducted of the sew treatment system, storm drainage system, plant operators' laboratory procedures. The tr ment facility was designed for 0.75 mgd and well-run low-rate trickling filter plant. Second treatment is provided to 0.393 mgd of aver strength sewage. While the base has received final NPDES permit, the plant will require mo cations to meet water quality limits as of Jul 1977. It was recommended that a stream dissol oxygen survey be used to gather data on the ef of waste discharge on receiving waters. A s pling protocol was included to supplement sew treatment plant monitoring requirements. Sou of industrial waste discharge to the storm se system were identified, and current planning cludes oil-water separators and pipes to con these streams to the sanitary system. (Kra FIRL)
W76-05076

MERCURY DYNAMICS IN A WARMWA STREAM RECEIVING MUNICIPAL WAS WATER,
Michigan State Univ., East Lansing. Inst. of W Research.
For primary bibliographic entry see Field 5C.
W76-05077

FACTORS AFFECTING RESPIRATORY Q TIENT--APPLICATION TO PURE OXY SYSTEMS,
Manhattan Coll., Bronx, N. Y. Dept. of Env mental Engineering and Science.
J. A. Mueller, and A. S. Pannu.
In: Proceedings of the 29th Industrial Waste ference, May 7-9, 1974, Purdue Univ Lafayette, Indiana, p 846-856, 1975. 7 fig, 8 t ref.

Descriptors: *Aeration, *Waste water treat *Biological treatment, Waste treatment, Alk ty, Nitrification, Denitrification, Monit *Model studies, Analytical techniques, Aer *Oxidation, *Kinetics.
Identifiers: *Respiratory quotient(RQ).

Factors influencing the design of pure o aeration systems for both municipal and ind wastes are discussed. Models have developed relating gas transfer kinetics liquid phase biological oxidation kinetics. To rately model complex waste treatment sy basic biological parameters such as respi quotient (RQ) and cell composition are re Because data on these parameters is ge non-definitive, experimental studies are The factors affecting RQ have been shown type of substrate; type of nitrogen nutrien strate removal efficiency, F/M loading cel and decay coefficients when nitrate is growth nutrient; and formation of partia idized intermediates. An often neglected p ter that can be used to quantitatively follow ical growth, denitrification, and nitrificatio alkalinity change. This can be easily mo and gives an indication of nitrogen utili (Kramer-FIRL)
W76-05078

PRETREATMENT AND ULTIMATE DIS OF WASTEWATER SOLIDS.
Environmental Protection Agency, New Yo gion II
Available from the National Technical In tion Service, Springfield, Va 22161 as PB-

50 in paper copy, $2.25 in microfiche. Report
A-902/9-74-002, May 1974. Proceedings of a
earch Symposium, Rutgers University, New
nswick, N.J., May 21-22, 1974. 476 p, 106 fig,
ab, 195 ref. Edited by Arnold Freiberger.

criptors: Publications, *Waste disposal,
dge disposal, *Sludge treatment, Legislation,
vage sludge, *Waste water treatment, En-
nmental effects, Planning, Bioassay, Dewater-
*Bibliographies, Conferences, Reviews.
tifiers: *Ocean disposal, Land application.

teen papers have been published from a con-
ice on the land disposal of sewage sludge.
cs included were: sludge handling and
sal; the stabilization of municipal sewage
e by high lime doses; the thermal degradation
udge; thickening characteristics of aluminum
ron primary sewage sludges; the dewatering
nysical-chemical sludges; and the standards
sludge incinerators. Problems in sludge
uction and handling systems were also
ssed. The Environmental Protection Agen-
position on ocean disposal in the New York
was presented and economic considerations
he planning of a sewage sludge disposal
m were outlined. Analytical methods were
proposed, such as bioassay for ocean sites
an evaluation of the impact of sludge
arge on an ocean bay. (See W76-05080 thru
05089) (Kramer-FIRL)
05079

**IENTAL ANALYSIS OF WASTEWATER
GES FROM 33 WASTEWATER TREAT-
T PLANTS IN THE UNITED STATES,**
nal Environmental Research Center, Cincin-
Ohio. Advanced Waste Treatment Research

Salotto, E. Grossman, III, and J. B. Farrell.
search Symposium on Pretreatment and Ul-
Disposal of Wastewater Solids, May 21-22,
New Brunswick, New Jersey, Rutgers
rsity, p 23-71. 7 fig, 11 tab, 17 ref.

iptors: *Waste water treatment, *Sludge,
nical analysis, *Pollutant identification,
ls, Treatment facilities, Municipal wastes,
matical studies, Anaerobic digestion,
stic wastes, Elements(Chemical), United
, *Nitrogen, *Phosphorus, *Sulfur.
iers: Atomic absorption analysis, Elemental
is, Scandinavian sludge, Log-normal dis-
on, Heat of combustion.

s, principally of the digested type, from 33
pal waste water treatment plants in the
States, have been analyzed for 21 metals,
trogen, phosphorus and sulfur. The plants
d ranged from small plants in urban com-
es to large plants in large cities. Some plants
rimary treatment, some used secondary
n and most used anaerobic digestion. Metal
t was determined by an atomic absorption
ure. No detectable amount of beryllium was
n any sludge sample analyzed and although
xic, it does not present a hazard in sludge
l. Mathematical analysis of the data in-
that the distribution of heavy metals in
s approximately log-normal. This behavior
cteristic of all sludge types analyzed so far.
of metal in essentially domestic sludges
und to correspond closely to the 25th per-
distribution of metals in all sludges re-
Comparison of the levels of metals in
States sludges with corresponding levels in
avian sludges showed higher levels in
States sludges. Variation of any particular
sludges of a particular waste water treat-
ant was much less than in sludge samples
rom different plants. The contents of
, phosphorus, sulfur and volatile solids
t of combustion were also determined for
amples. Heat of combustion was generally
or raw primary sludge than for digested
ecause of the greater amounts of volatile solids. Phosphorus and sulfur were concentrated in digested sludge while nitrogen had a lower concentration. (See also W76-05079) (Pinto-FIRL)
W76-05080

STABILIZATION OF MUNICIPAL SEWAGE SLUDGE BY HIGH LIME DOSE,
Battelle Pacific Northwest Labs., Richland, Wash. Water and Waste Management Section.
C. A. Counts, A. J. Shuckrow, and J. E. Smith.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 73-125. 7 fig, 15 tab, 5 ref.

Descriptors: *Municipal wastes, *Sewage sludge, *Stabilization, *Lime, Sludge, Crop production, Chemical properties, Alkalinity, Bacteria, Odor, Sludge treatment, Sludge disposal, Soil treatment, Nutrients, Pilot plants, Humus.
Identifiers: Land application.

The degree of stability produced in sludges by the addition of large amounts of lime was determined initially in the laboratory and then in a large pilot plant. The effects of spreading lime stabilized sludges on land used for crop production were determined in small scale greenhouse studies and on larger outdoor plots. Initial laboratory studies were conducted to develop basic information on the lime stabilization process itself and to develop data for use in design and operation of a pilot plant. Lime requirements, time dependency of the lime/sludge reaction, and bacteria and odor reduction were studied, using primary municipal sludge mixed with humus. Chemical characteristics of the sludge and the method used to mix it determined the amount of lime required to raise the sludge pH. The lime sludge reaction caused a decrease in pH over time. Significant reduction in bacteria and odor were achieved by lime treatment. In pilot plant study, various lime doses were applied to raw sludge and system pH response was observed. The lime dose required to achieve a pH of 12 was affected by the chemical composition of the sludge. Bacteria was reduced by over 99%. Lime treatment also improved the sludge's settling characteristics. Application of sludge to a silt loam soil appeared to increase permeability with water and application to a sandy soil decreased permeability. Lime treated sludge did not significantly increase soil pH. Applied to cropland, it did increase the concentrations of nutrients available to the plants. When proper amounts of lime treated sludge were applied, soil productivity appeared to improve. Excessive concentrations of nutrients did not appear to be a problem. (See also W76-05079) (Pinto-FIRL)
W76-05081

SLUDGE INCINERATORS IN USE TODAY THAT MEET THE REQUIREMENTS OF STATE AND FEDERAL REGULATIONS,
For primary bibliographic entry see Field 5E.
W76-05082

ECONOMIC CONSIDERATIONS FOR PLANNING SEWAGE SLUDGE DISPOSAL SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5E.
W76-05083

EPA'S POSITION ON OCEAN DISPOSAL IN THE NEW YORK BIGHT,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5E.
W76-05084

PRELIMINARY SUMMARY OF SLUDGE DEGRADATION STUDIES IN A MARINE BENTHIC ENVIRONMENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-05086

BIOASSAY METHODS AND IMPACT EVALUATION OF OCEAN DISPOSAL SITES,
Mounmouth Coll., West Long Branch, N. J.
For primary bibliographic entry see Field 5A.
W76-05087

EVALUATING THE IMPACT OF SLUDGE DISCHARGE TO SANTA MONICA BAY, CALIFORNIA,
California Univ., Berkeley; and Southern California Coastal Water Research Project, Berkeley.
For primary bibliographic entry see Field 5C.
W76-05088

A DISCUSSION OF A NEAR FIELD DISPERSION MODEL FOR SLUDGE DISCHARGES TO COASTAL WATERS,
Pacific Northwest Environmental Research Lab., Corvallis Oreg.
For primary bibliographic entry see Field 5B.
W76-05089

A PILOT STUDY OF DRINKING WATER SYSTEMS IN THE NATIONAL PARK SERVICE,
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-05090

CROSS-CONNECTION CONTROL MANUAL.
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-05092

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
D. A. Baker.
Journal Water Pollution Control Federation, Vol. 47, No. 6, p 1476-1479, June, 1975. 25 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Oil wastes, Activated carbon, Oxidation, Activated sludge, Aeration, Filtration, Flotation, Biological treatment, Toxicity, Phenols, Separation techniques, Automatic control, *Reviews, *Bibliographies.
Identifiers: *Petroleum refinery wastes.

The 1974 literature concerned with the treatment of wastes from petroleum refineries was reviewed. Reports are given for refinery wastes treated by the following processes: activated carbon adsorption; oxidation of sulfides to water soluble sulfates or thiosulfates; activated sludge; two-stage aeration followed by sand filtration; dissolved air flotation with chemical coagulation; joint removal of iron and sulfides; completely mixed activated sludge using a deep tank configuration; mechanical separation and recirculation of oily waste waters; and treatment of combined municipal and refinery effluents by biological methods. Toxicity studies were performed. Phenol was found to be the controlling toxicant in a significant number of oil refinery waste discharges. The toxicity was found to increase with temperature. Other topics in the current literature include disposal of refinery salt wastes, site location of new plants, microbial degradation of oil wastes, and automatic control of treatment facilities. (Orr-FIRL)
W76-05093

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
J. W. Patterson, and M. H. Cheng.
Journal Water Pollution Control Federation, Vol. 47, No. p 1473-1476, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Reviews, Standards, Biological treatment, Water pollution sources, Suspended solids, Coagulation, Filtration, Cyclones, Separation techniques, Oily wastes, Skimming, Underground waste disposal, Phenols, Ammonia, Sulfides, Lead, Zinc, Metals, Water reuse, *Bibliographies.
Identifiers: Steel industry, Effluent guidelines, Coke oven wastes, Pickling liquor, Metal finishing.

The recent literature dealing with the treatment of steel industry wastes was reviewed. Effluent guidelines and standards published by the EPA for the iron and steel manufacturing industry have established effluent limitations for ammonia, cyanide, oil and grease, suspended solids, sulfide, fluoride, nitrate, Pb, Mn, and Zn. Major waste water sources are coke oven gas washing and cooling, blast furnace washing, and steel rolling and finishing operations. Coke plant effluent, containing phenols, ammonia, cyanide, and thiocyanide, has been treated by biological methods. Steel rolling and finishing has four major types of waste water associated with it: pickling liquor; suspended solids; oily wastes; and blast furnace wash water. Recirculating systems have been designed for the latter. Coagulation, filtration, dissolved air flotation with coagulant agents, and cyclone separation have all been employed for suspended solids removal. Oily waste treatment usually consists of skimming in scale pits followed by filtration, coagulation, or air flotation. The steel industry has largely converted to HCl pickling because it allows for the regeneration of the acid for reuse by roasting and also permits the recovery of ferric chloride or ferric oxide as a byproduct. Subsurface disposal (deep well injection) of pickling liquor is also widely used. Pickling rinse waters may be treated by neutralization, aeration, oxidation, flocculation, and clarification. (Orr-FIRL)
W76-05094

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) Associates, Media, Pa.
R. S. Talbot.
Journal Water Pollution Control Federation, Vol. 47, No. 6, p 1465-1466, June, 1975. 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Reviews, Water pollution control, Standards, Activated carbon, Ozone, Reverse osmosis, Trickling filters, Color, Dyes, Oil, Chemical oxygen demand, *Bibliographies.
Identifiers: Wool scouring liquors, Pretreatment, Decoloration, Effluent guidelines.

A brief review of the 1974 literature on the treatment of textile wastes is presented. An evaluation of the economic effects of proposed effluent guidelines on the textile industry was prepared. The Ecological and Toxicological Associations of the Dye-stuff's Manufacturing Industry was found to pool information and financial support for research in their area. Methods reported for the decoloration of textile wastes included activated carbon, ozone, reverse osmosis, and reduction with hydrogen. Staging of trickling filter treatment of dyeing wastes was found to be capable of effecting greater than 70% BOD removal, but did not achieve decoloration. COD reductions to 55% were obtained by ozonation. Treatment with activated carbon in combination with ozone exhibited a synergistic effect on dyeing wastes. A case history of the pretreatment of wastes from screen printing synthetic fabrics prior to discharge into a municipal system was reported. Grease and oil were found to be the most troublesome constituents in wool processing effluents. Grease removal is considered necessary before biological treatment of wool-scouring liquors. (Orr-FIRL)
W76-05095

HISTORY AND DEVELOPMENT OF AWWA STANDARDS,
Alvord, Burdick and Howson, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-05096

PROTECTING REINFORCED CONCRETE PIPE SANITARY SEWERS,
For primary bibliographic entry see Field 8F.
W76-05099

THE MOLECULAR WEIGHT DISTRIBUTION OF SOLUBLE ORGANICS IN SEWAGE AND SEWAGE EFFLUENTS USING GEL FILTRATION,
Rutgers - The State Univ., New Brunswick, N. J.
R. J. Carton.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 75-24,671. PhD Thesis, 1975, 165 p.

Descriptors: *Waste water treatment, *Sewage, *Activated sludge, Organic compounds, Molecular weights, Adsorption, Analytical techniques.
Identifiers: Total organic carbon.

In order to develop more sophisticated waste water treatment systems, our knowledge of specific chemical and physical changes occurring in sewage must be increased. The molecular weight distribution of soluble organic compounds in sewage, and in biologically and chemically treated effluents determined by gel filtration is described. Raw sewage and activated sludge effluent samples were taken from the Bernardsville, New Jersey, sewage treatment plant. Particulates were removed by sedimentation, ultracentrifugation, and filtration through a Millipore filter. Samples of raw sewage and effluent were also coagulated with ferric chloride, filtered and eluted on Sephadex. Samples containing less than 30 mg/liter TOC were concentrated by flash evaporation at 40C. The soluble fraction of raw sewage contained a continuous distribution of TOC from 0 to 1500 MW. The exclusion peak at Vo contained 21% of the organic carbon. About 40-50% of the TOC was partially adsorbed on the column. Concentration of the soluble fraction of raw sewage by flash evaporation changed the molecular weight distribution. One-third of the compounds above 1500 MW were coagulated and removed by filtration through a 0.45 micrometer Millipore filter. Coagulation with ferric chloride produced alterations in the molecular weight distribution. No peak was present at 1500 MW, and the amount of low molecular weight compoundsght compounds for ferric and chloride ions, and then the colloidal particles and high molecular weight compounds are coagulated. About 42% of the activated sludge effluent of the TOC compounds were greater than 1400 MW as compared to about 20% for raw sewage. (Orr-FIRL)
W76-05101

CHARACTERIZATION OF USAGE AND WASTEWATER IN ROADSIDE REST AREAS,
West Virginia Univ., Morgantown.
A. V. Peddada.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 75-21,949. PhD Thesis, 1975, 282 p.

Descriptors: *Sewage treatment, *Water supply, *Statistical analysis, *Equations, *Computers, Highways, Water consumption, Design criteria, Planning, *Waste water treatment.
Identifiers: Highway rest areas.

Five highway rest areas in different geographica locations were evaluated in terms of traffic, wate consumption, sewage production, and sewag strength. Data was collected and processed b computer. Statistical analyses were used t develop design equations for water supply an sewage treatment design parameters. The equa tions developed may be used to design future re area sewage and water supply systems. (Krame FIRL)
W76-05102

RATES AND MECHANISMS OF CHEMICA REACTIONS DURING FLOW OF SECONDAR TREATED SEWAGE EFFLUENT THROUG POROUS BEDS,
California Inst. of Tech., Pasadena.
J. Uradnisheck, III.
Available from University Microfilms, Inc., A Arbor, Mich., 48106. Order No. 74-24792. Pt Thesis, 1975, 356 p.

Descriptors: *Waste water treatment, *Sewa treatment, *Soil, Percolation, Chemical reactio Ion exchange, Waste water disposal, Porc media, *Path of pollutants.

The rates and mechanisms of chemical reactic which occur as secondary treated sewage efflu flows through porous beds were studied. Exp mental data show that the variation of aqueous tions in inorganic percolating solutions is the re of consecutive stages of rapid ion exchange of tions from the electric double layer followed slow ion exchange of chmisorbed cations diffus through aluminosilicate mineral structures. H concentrations of alkaline earth salts which rem in interstitial solutions when solution is drai from granitic sand are caused by desorption of tions from the sand by aqueous hydrogen ic The hydrogen ions are generated by the conv sion of adsorbed ammonium ions to nitrite ions Nitrosomonas. A slight amount of mineral diss tion occurs. When a solution is again percola through the sand, only a slight degree of nitrif tion accompanies the hydrogen ion desorption mathematical model is presented which can used to predict the variation of aqueous calci magnesium, sodium, ammonium, nitrate, nit oxygen, acidity, and bicarbonate ions as wel the bacterial population densities, adsorbed tions, and gaseous constituents of a soil col and solution as an intermittent percolation pro is operated. (Orr-FIRL)
W76-05103

REFINERY DESIGN (CIRCA 1984),
Fluor Engineers and Constructors, Inc., Los geles, Calif.
J. E. Llovet, H. J. Klooster, and D. G. Chapel.
Chemical Engineering Progress, Vol. 71, No. 85-90, June, 1975. 5 fig, 3 tab, 1 ref.

Descriptors: *Industrial wastes, *Waste w treatment, *Oil industry, *Design criteria, Oil lution, Energy budget, Environmental co Project planning, Treatment facilities, Env mental effects, Aesthetics.
Identifiers: Refinery design, Task force appro

Refinery design must be based on a balan energy conservation, environmental control profit considerations. A task force approa refinery design allows an early comparis energy saving concepts and systems which be studied in order to achieve the desired bal Current, proven hydrogen refinery processe related technologies should be used to up crude oil in a refinery configuration meeting gy/environmental objectives. Innovative de which contain, retain, treat, and recirculate a imum of effluent gas and liquid streams wil aid in achieving these goals. Development vanced refinery design layout and operationa trols will minimize the impact of the refinery local area. Nine environmentally related

es which should be included in overall refinery sign are: atmospheric emissions control; waste uid treatment; solids handling/disposal; noise atement; site utilization; construction and eration controls; light abatement; odor control; d aesthetics. The factors affecting energy con- rvation are specific to each refinery and depend such parameters as fuel availability and cost, e location, environmental regulations, and initial pital outlay vs. reduced future operation costs. rr-FIRL)
76-05104

FECT OF TEMPERATURE AND SLUDGE ADING ON BOD5 REMOVAL AND SLUDGE TTLEABILITY IN ACTIVATED SLUDGE STEMS TREATING BLEACHED KRAFT EF- UENTS,
C. Research, Vancouver, (British Columbia).
G-H. Lee, J. C. Muller, and C. C. Walden.
ppi, Vol. 58, No. 6, p 100-103, June, 1975. 6 fig, ab, 10 ref.

scriptors: *Waste water treatment, *Industrial stes, *Pulp wastes, Biochemical oxygen de- nd, *Activated sludge, *Sludge treatment, mperature, Microorganisms, Populations, otozoa.
ntifiers: Bleached kraft wastes, Sludge settlea- ty, Food/microorganism ratio, Metazoa, OD5 removal.

mperature and food/microorganism ratio (F/M o, equivalent to sludge loading) effects on D5 removal, sludge settleability, and changes microbial populations in activated sludge tems treating bleached kraft effluent were eval- ed. F/M ratios ranged from 0.1 to 2.4. Tempera- es tested were 16, 30, 36, and 40C. Overall D5 removal was good at all temperatures and M ratios; a small decrease occurred when the perature and F/M ratio were increased. At peratures greater than 30 C, sludge settleability s significantly inhibited. F/M ratios had little ef- t on sludge settleability. Suspended solids con- t increased greatly with increasing temperature, was not significantly affected by F/M ratios. M ratios and temperature were observed to have imal effects on sludge volume indices. In- ased temperatures (greater than or equal to ') caused a drastic reduction in the numbers of otozoa and metazoa present in the activated dge. However, protozoa and metazoa grew well leached kraft effluent within their suitable tem- ature ranges. Although the microorganisms essary to achieve BOD5 reduction are present n 16-40C, the poor sludge settleability at the er temperatures may be an indication that the roorganisms present at these temperatures are as effective in the production of the saccharide considered to be the cementing erial in activated sludge. (Orr-FIRL)
5-05105

LUENT CONTROL AND WATER CONSER- TION AT BOWATER-SCOTT MILL, RTHFLEET.
er Services, Vol. 79, No. 951, p 196-197, May, . 3 fig.

criptors: *Waste water treatment, *Industrial es, *Pulp wastes, Treatment facilities, Floc- tion, Equipment, Screens, Polymers, Water e, Sumps, Coagulation, Sludge treatment, Fil- on, *Water conservation.
tifiers: Vacuum filtration, Alum, Anionic mers, Cationic polymers, United Kingdom.

ater-Scotts' disposable paper products plant orthfleet in Kent, U.K., has built a new 80,000 effluent treatment plant. The effluent from the is segregated into two streams: a 'clean' m containing fiber from the paper-making hines; and, a 'dirty' stream from floor drains overflows. Each stream is collected by a 00 gallon capacity sump and fed into a Contact Flocculator by a sump pump through a magnetic flowmeter. The dirty stream is also passed through a screen to remove coarse rubbish before entering the flocculator. Alum (50-150 ppm) and an anionic polymer are used as the coagulants in the clean water flocculator, while a cationic polymer is used for the dirty water. Sludge from both flocculators is passed to a common sludge tank and then fed to a rotary vacuum sludge filter. Water from the clean water flocculator is fed to a reusable water tank. The dirty water with a maximum solids content of 10 ppm, is discharged to a river. (Orr-FIRL)
W76-05106

HOW MILLS COPE WITH EFFLUENT SUSPENDED SOLIDS,
Great Southern Paper Co., Cedar Springs, Ga.
O. D. Smith, R. M. Stein, and C. E. Adams.
Paper Trade Journal, Vol. 159, No. 17, p 35, July, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp wastes, *Aerated lagoons, Suspended solids, Coagulation, Filtration, Costs, Georgia.
Identifiers: Unbleached kraft wastes, *Holding ponds, Mixed media filtration, Clarification.

Great Southern Paper Company's plant at Cedar Springs, Georgia, is an integrated unbleached kraft-neutral semi-chemical cross recovery pulp and paper mill. The wastes from the plant are treated in an aerated lagoon and then flow into a 160 million gallon holding pond before being discharged into a river. The river is regulated by a hydroelectric navigation dam which causes a low flow during the weekend due to reduced power requirements. As a result, the mill's effluent can only be discharged between Monday and Friday. Monitoring of the suspended solids (ss) level of the effluent indicated that good removal was being achieved over the weekend but that the level of ss in the effluent increased during the week. The decreasing solids reduction is attributed to the fact that the rate of discharge from the holding pond during the week is higher than the flow rate into the pond, resulting in a shorter detention time. Chemical coagulation; a conventional clarifier, with or without the use of coagulant aids; and mixed-media filtration were evaluated for their ability to reduce the concentration. The results of the studies showed that the ss in the effluent of a pulp and paper mill can be reduced but only by the use of a large system with significant chemical addition. The price of reducing ss to 4.2 lb/ton of product was estimated to be $3.17/ton of product. (Orr-FIRL)
W76-05107

POLLUTION CONTROL IN THE SWEDISH PULP AND PAPER INDUSTRY,
Swedish Pollution Control Co., Stockholm.
H. Norrstroem.
Ambio, Vol. 4, No. 2, p 80-86, 1975. 3 fig, 4 tab, 35 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Water pollution control, Water pollution sources, *Pollution abatement, Foreign research, *Pulp wastes.
Identifiers: *Sweden, SSVL Environmental Care Project.

The discharge of air and water pollutants from the Swedish pulp and paper industry is rapidly decreasing. This decrease is attributed to the regulations of the Environmental Protection Act and process improvements and development work done by the Swedish pulp and paper industry including pollution-decreasing measures developed during the SSVL Environmental Care Project. Water pollutants from the industry include colored material, biodegradable material, toxic material, and salts. Process discharges by the industry are summarized. Suitable choice of process, internal process modifications, and external effluent treatment are the methods to reduce the water pollution. A reduction in effluent volume and discharge of pollutants from washing and screening operations can be effected by improving the washing efficiency and closing the water systems in screening. Accidental discharges should be collected as soon and as undiluted as possible and then should be recycled. Existing internal measures for reducing the pollution from the bleaching effluents include: lowering the lignin content of the unbleached pulp; changing the bleaching conditions; and, instituting oxygen bleaching. Although the pulp and paper industry in Sweden has grown rapidly, the pollution level has been reduced to that of the 1920's. (Orr-FIRL)
W76-05108

THE FATE OF TURPENTINE IN AERATED LAGOONS,
Beak Consultants Ltd., Vancouver (British Columbia).
D. Wilson, and B. Hrutfiord.
Pulp and Paper Canada, Vol. 76, No. 6, p 91-93, June, 1975. 3 fig, 3 tab, 9 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, *Aerated lagoons, *Pulp wastes, Pollutant identification, Biochemical oxygen demand, Sulfur compounds.
Identifiers: *Turpentine, Terpenes, Bleached kraft wastes, Unbleached kraft wastes.

The identification of turpentine and related compounds in bleached and unbleached kraft pulp mill waste water and their fate in aerated lagoons was determined. Twenty-one monoterpenes were identified in the influent and effluent of the aerated lagoon samples. Also identified were two organo-sulfur compounds, diethyl disulfide and dimethyl trisulfide, not previously found in kraft mill waste water. The bleaching process appeared to have no effect on the turpentine compounds. The ease of degradation of the terpenes decreased in the following order: alcohol, hydrocarbons, ketone. Camphor and fenchone are produced in the lagoon, most probably by microbial transformation of terpene alcohols. The turpentine concentrations were reduced to less than one ppm; this level appears to cause self-limitation of removal efficiency. Terpene concentration level was implicated in the BOD5 removal efficiency of the lagoon. The average turpentine removal efficiency was 90 percent for the lagoon receiving unbleached effluent and 65 percent for the one receiving bleached effluent. (Orr-FIRL)
W76-05109

PURIFICATION OF TEXTILE WASTE WATER-RESULTS OF EXPERIMENT SERIES (REINIGUNG VON TEXTILABWAESSERN-ERGEBNISSE VON VERSUCHEN),
B. Hoeke, and G. Piepenbreier.
Gesundheitstechnik, No. 6, p 117-124, June, 1975. 14 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Activated carbon, Pilot plants, Oxidation, Precipitation, Flocculation, Chemical oxygen demand, Color.
Identifiers: Decoloration, *Wet catalytic oxidation, Total organic carbon, *Alkaline waste water.

Pilot tests concerning the purification of alkaline waste waters generated in the textile industry are described. The test results were achieved when the waste water to be treated was first neutralized with flue gases containing carbon dioxide and sulfur dioxide, after which three-stage wet catalytic oxidation with activated carbon in an aeration tank was performed. The activated carbon particles were continuously regenerated through constant friction on each other in the suspension. The catalytic oxidation was followed by precipitation and flocculation by the addition of ferrous sulfate, aluminum sulfate, and flocculating agents such as polyacrylamide and silicic acid. The reduction

achieved by this procedure in the COD and TOC levels amounted to 86-90%, respectively; full decoloration was reached. Stable sludge suitable for normal disposal was obtained. (Takacs-FIRL)
W76-05110

THE TREATMENT OF TEXTILE DYEHOUSE EFFLUENT.
Water Services, Vol. 79, No. 951, p 198-199, May, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Dyes, *Pilot plants, *Biological treatment, Biochemical oxygen demand, Color, Treatment facilities, *Filtration.
Identifiers: Flocor, Plastic media, *Biofilter.

A pilot plant study using Flocor plastic media was performed on the effluent from the textile works of John Heathcoat, Ltd. at Triverton, G. B. The major conclusions of the study included: the main source of contamination was the discharge of effluent from the dyehouse; the BOD content of the dyehouse waste averated between 30 and 100 mg/liter with a maximum value of 400 mg/liter; the fluctuations in pH necessitated automatic and regular control; and, a high-rate plastic biofilter medium was an effective means of reducing the BOD to the acceptable 40 mg/liter level and also provided a reduction in color. As a result of the pilot study conclusions, a fullscale one mgd treatment plant has been built. It comprises a high-rate biofilter plant incorporating balancing facilities of 60,000 gal capacity, automatic pH control and reagent feed facilities, and a 12 x 2.4 x9 m biofilter tower packed with 226 cu m of Flocor. Advantages of the plant are that it requires less land area than a comparable facility, needs minimal maintenance, and is capable of handling shock loads of BOD. (Orr-FIRL)
W76-05111

PRODUCTION OF FEED YEAST FROM LIQUID WASTE,
Hochschule fuer Bodenkultur, Vienna (Austria). Institut fuer Angewandte Mikrobiologie.
J. Meyrath.
Process Biochemistry, Vol. 10, No. 2, p 20-22, April, 1975. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Activated sludge, *Yeasts, Fermentation, Economics.
Identifiers: Yeast production.

Yeast, rather than bacteria, can be used in the purification of waste water by activated sludge. Conditions necessary for economic success are high yield based on COD; high productivity per unit fermenter volume; low pretreatment costs of the wastes; easy recovery of yeast from low-concentration media; and economical additive and cooling water requirements. The use of highly flocculant yeasts enables these requirements to be met by eliminating the need for centrifugal separation. Also, the ability to operate at elevated temperatures (40 C) is an economic asset. To eliminate extensive cooling requirements, thermophilic yeast strains must be used (such as Candida krusei, or Candida tropicalis). To demonstrate the efficiency of this process, Saccharomyces kloeckerianus was used with a sugar solution (4.17 g/liter), and with mineral salts as an additive. The solution was fed (2.8 liter/hour) to a fermenter with a culture volume of 3.5-3.7 liter, pH of 4.2, and temperature of 39 C. Overflow drained into a 150 ml conical vessel where yeast sedimentation occurred immediately. Sedimentary yeast was returned dry to the fermenter so that a yeast concentration of 15.1 g was maintained. Excess yeast could then be collected from a second sedimentation vessel. Productivity can be raised at will, since it depends on the concentration of yeast in the fermenter, feed rate of nutrient solution to the fermenter and the oxygen transfer capacity of the fermenter. This procedure is well suited for small installations, as the process is simple and insensitive to microbial contamination. (Murphy-FIRL)
W76-05112

A NEW CONCEPT IN SLUDGE FILTRATION THEORY FOR INDUSTRIAL APPLICATION,
Air Force Weapons Lab., Kirtland AFB, N. Mex. Environics Lab.
S. P. Shelton, and J. C. Burdick, III.
Filtration and Separation, Vol. 12, No. 3, p 233-237, May/June, 1975.4 fig, 8 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Model studies, *Sludge treatment, *Filtration, Separation techniques, *Mathematical models.
Identifiers: Vacuum filtration, Filtration velocity, Cake compression, *Sludge filtration.

A quantitative model was developed to describe sludge filtration processes as a function of the characteristics of fluid, suspended particles, and filter media. The model, primarily concerned with vacuum filtration systems, requires data that describes the sludge, filter, and the operating conditions in order that the relationship between flow time, pressure drop, and efficiency can be evaluated. It considers the change in filtration velocity at constant pressure across the filter system, and can consider cake compression by expression of cake thickness and bulk density as a pressure dependent function. The new concepts developed for application to sludge filtration performed well in the parameter study, which indicated that sludge particles and their concentration strongly influenced their filtration characteristics. The model agreed well with preliminary experimental data, including the prediction of the relationship between pressure drop and cake thickness for incompressible and compressible filters. The described sludge filtration model, developed from aerosol mechanic theory, adequately predicts flow, time, pressure and efficiency relationships. (Murphy-FIL)
W76-05114

FOAM SEPARATION - A TECHNIQUE FOR WATER POLLUTION ABATEMENT,
B. C. Research, Vancouver (British Columbia).
K. S. Ng, and J. C. Mueller.
Water and Sewage Works, Vol. 122, No. 6, p 48, 52, 54-55, June, 1975. 6 fig, 19 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Foam separation, *Foam fractionation, *Froth flotation, Separation techniques, Surfactants, Alkylbenzene sulfonates, Operating costs, Textiles, Food processing industry, Bubbles.
Identifiers: Metals removal, Surface active agents.

Foam separation, the process that selectively separates the surface active components of a solution at the surfaces of ascending bubbles, can be characterized by two mechanisms: foam fractionation and froth flotation. Foam fractionation separates dissolved substances from homogenous solutions. The liquid phase hydrophobic group of the surface active molecule migrates to the bubble-liquid interface and becomes stable with air. The hydrophilic poles of the molecules remain in the liquid phase. The bubbles float to the top of the liquid and form a foam blanket in which the surface active material accumulates. When the foam layer is removed, the surface active substances are removed. Similarly, froth flotation removes insoluble suspended matter by providing sites for attachment of hydrophobic suspended matter through pressurized dissolved air release. The foam layer which forms can then be removed. Foam fractionation is presently used for removal of ABS detergents, anionic sodium dodecylsulfate and cationic hexadecylpyridinium chloride. The operating cost using a mechanical air dispersion system ranges from 2.7 to 3.5 cents per 1000 gal/ton for a 10 mgd plant. This process has been proposed for concentrating proteins from dilute solutions; and for use in treatment of wastes from food processing and textile plants. It may also become a practical technique for the treatment of metal contaminated water. (Murphy-FIRL)
W76-05115

BLEACHING AND CLARIFYING OF AQUEOUS EFFLUENT.
French Patent 10128W/06. Issued March 21, 1975.
French Patents Abstracts, Vol. W, No. 18, p 3, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Ozone, Chlorine, *Patents, Effluents, Aqueous solutions, Color.
Identifiers: Vitamin B2, Clarification, *Bleaching, Decolorization.

A patent has been issued for a method of bleaching and clarifying the aqueous effluent from the preparation of vitamin B2. The decoloration/clarification is accomplished by injecting finely divided air and finely divided ozone at almost the same point in the waste stream. The air will contain preferably 4-6 percent ozone. Chlorine may also be injected but not enough for all the ozone to react. The ratio of chlorine to ozone can be 1:5 to 3:1, but is preferably 1:2. This process is more effective and less expensive than previous methods. (Orr-FIRL)
W76-05116

REMOVAL OF TRACE LEVELS OF 2-ACETYLAMINOFLUORENE (2-AAF) FROM WASTEWATER,
National Center for Toxicological Research, Jefferson, Ark.
C. R. Nony, E. J. Treglown, and M. C. Bowman.
The Science of the Total Environment, Vol. 4, 155-163, 1975. 3 fig, 1 tab, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical wastes, *Adsorption, *Filters, *Activated carbon, Polymers, Pilot plants, Pollutant identification, Trace elements.
Identifiers: *2-Acetylaminofluorene, Polymeric adsorbents, Spectrofluorometry.

A pilot scale adsorption is described for the removal of ppb levels of the chemical carcinogen 2-acetylaminofluorene (2-AAF), from industrial waste water. The system consists primarily of filters, activated carbon, and non-ionic polymeric adsorbents arranged in tandem. The process is highly efficient, operates at low cost, and requires little maintenance. A highly sensitive and specific spectro-fluorometric identification technique was developed for monitoring the raw or treated water. The method is sensitive to the 0.2 ppb level of the chemical. Several other possible methods for removing 2-AAF were evaluated. These included millipore filtration, distillation, organic solvent extraction, alkaline hydrolysis, and carbon and non-ionic polymeric adsorption. Only the adsorption techniques were effective in removing 2-AAF and were therefore incorporated into the pilot system. Future modification of the system will include the scaling-up of the components to provide a higher capacity. (Orr-FIRL)
W76-05117

THE BREAKDOWN OF SYNTHETIC ORGANIC COMPOUNDS IN BIOLOGICAL PROCESSES.
Water Pollution Research Lab., Stevenage (England).
N. S. Thom, and A. R. Agg.
Proceedings of the Royal Society of London, Vol. 189, No. 1096, p 347-357, May, 1975. 4 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Biodegradation, Persistence, Organic pollutants, Toxicity.
Identifiers: Synthetic chemicals, United Kingdom, Relative biodegradability.

he biodegradability of what are considered to be
e most important synthetic chemicals, relative to
ater pollution, in the U.K. is discussed. Over 200
mpounds have been sorted into one of three
eneralized groups: compounds readily removed
biological processes; compounds requiring ac-
imatization of the degrading organism; and, com-
unds resistant to biodegradation. The discharge
easily biodegraded substances to a sewage
eatment plant requires control only of the
lume and rate of aeration of the plant. In order
achieve removal of compounds which may be
moved if acclimatization is reached, three condi-
ns must be fulfilled: the initial concentration at
hich the compound is to be applied to the treat-
ent plant should be very low and be gradually in-
eased to the final concentration; there must be a
ntinuous discharge of the pollutant; and, once
climatization has been reached and removal is
hieved, the concentration of the compound must
main relatively constant. Some of the non-
odegradable substances may be removed by ad-
rption onto sludge or clay. The use of others,
ch as 'hard' synthetic detergents and or-
nochlorine insecticides, has been severly
stricted. Many of the persistant chemicals are
xic to mammals and aquatic life. Information on
e biodegradability of any compound must be
nsidered in relation to the ambient conditions.
rr-FIRL)
76-05118

REATMENT OF PROCESS WATER,
tro-Tex Chemical Corp., Houston, Tex.
Merchant.
nited States Patent 3,890,227. Issued June 17,
75. Official Gazette of the United States Patent
fice, Vol. 935, No. 3, p 1205, June, 1975.

escriptors: *Waste water treatment, *Industrial
stes, *Chemical wastes, Polymers, Chemical
ecipitation, *Patents, Salts.
entifiers: *Polymerization process wastes.

process designed for the treatment of process
ter from polymerization process has been
tented. The process provides for the removal of
lts of the condensation product of naphthalene
lfonic acids and formaldehyde. The process
ter to be treated contains these salts in an
ount less than two weight percent and contains
s than five percent total solids. The aqueous
mposition containing the salts is mixed with a
lyalkylene amine of the formula H2N(-R-
H)xH, where R is an aliphatic radical of one to
e carbon atoms and x is from one to twelve. The
is maintained at less than 5.0 by the addition of
d. The salts are thereby precipitated out of solu-
n. (Orr-FIRL)
76-05119

**CYCLING OF COOLING WATER IN CABLE
ANUFACTURE,**
estern Electric Co., Buffalo, N.Y.
R. Benenati.
re Journal, Vol. 8, No. 6, p 61-65, June, 1975. 7

escriptors: *Waste water treatment, *Industrial
stes, *Cooling water, *Water reuse, Cooling
vers, *Recirculated water, Water consumption,
ter conservation, Industrial water, *Recycling,
w York.
ntifiers: Zero discharge, Cable manufacturing
stes.

e Buffalo Works (Buffalo, N.Y.) of the Western
ctric Company recirculates and reuses the
er required for cooling hot plastic jacketing as
extruded and formed around the outside of
le. Water consumption has been reduced by 95
cent; conservation equals about 90 million
year. The system uses a unique injection,
y type commercial cooling tower chosen
ause of its reliability, ease of installation and
ntenance, and reduced installation and main-
tenance costs. The cooling tower, two pumps, and a previously unused tank comprise the recirculating system. There are two water circulating loops in the system. The second loop is activated to send more water through the cooling tower circuit when the temperature of the water from the first loop rises above a given temperature. Water supply and temperature adjustmentis automatically controlled. The recirculating system has performed successfully since its initiation in December 1972. The costs of the system have been offset by the reduction in the need for municipal water. The system represents one way to reduce industrial water consumption and to achieve zero discharge. (Orr-FIRL)
W76-05120

NEW BUILDING DESIGNED WITH POLLUTION CONTROL IN MIND.
Plant Engineering, Vol. 29, No. 13, p 36, 40, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, Neutralization, Oxidation, Chemical precipitation, Filtration, Water reuse, Potable water, Chromium, Cadmium, Copper, Suspended solids, Treatment facilities, Indiana.
Identifiers: *Plating wastes, *Metal finishing wastes, Cyanide.

Penn Control's plating and finishing processes building in Goshen, Indiana, was designed with a continuous-batch treatment system in the basement. The system applies cyanide oxidation and chromium reduction principles to produce potable water from plating wastes containing cyanide, chromium, cadmium, copper, and other suspended solids. The effluent treatment system consists of two 700-gal tanks which receive chromic acid conversion coating rinse water, two 1100-gal tanks which receive all the cyanide rinse water, and one 7000-gal neutralization tank which receives treated water from the chromic acid and cyanide tanks plus all the other process waters. The chromic acid wastes are treated with sulfur dioxide and then liquid caustic soda (NaOH) to reduce the chrome to the trivalent form. Chlorine gas and sulfuric acid are used in sequence to oxidize the cyanide to sodium cyanate and then to carbon dioxide, carbonates, and other nontoxic compounds. The treated waste waters flow into the neutralization tank where precipitation of the trivalent chrome, heavy metals, and solids occurs. Water from the neutralization tank is filtered through a deep-bed filter that uses a 25 micron, roll-type paper with an automatic dispensing system. (Orr-FIRL)
W76-05121

APPARATUS AND PROCESS FOR TREATING TOXIC WASTE MATERIALS,
A. N. Sulfaro, and A. H. Stein.
Canadian Patent 970,485. Issued July 1, 1975. Patent Office Record, Vol. 103, No. 26, p 83, July, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Toxicity, Monitoring, Chromium, Metals, Equipment, Aquatic life.
Identifiers: *Metal finishing wastes, Cyanide, *Two-stage treatment, *Chemical treatment.

An apparatus and method for the continuous treatment and destruction of toxic constituents in waste water streams from metal finishing processes has been patented. It is designed for the treatment of aqueous rinse solutions containing dissolved hexavalent chromium and cyanide compounds present in concentrations which are toxic to marine ecology. The apparatus and process provide for a two-stage treatment of such waste streams. The streams are continuously recirculated in each stage and their chemical characteristics are continuously monitored and adjusted to maintain optimum conditions for the desired chemical reaction which will remove the toxic constituents. The monitoring also ensures that the effluent to be discharged from the treatment apparatus does not contain any harmful constituents. (Orr-FIRL)
W76-05122

TREATMENT TECHNIQUE FOR HARMFUL SUBSTANCES IN WATER POLLUTION (SUISHITSU ODAKU KANKEI YUGAI BUSHITSU SHORI GIJUTSU),
S. Sakai.
PPM, Vol. 6, No. 5, p 60-76, May, 1975. 6 fig, 17 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Oxidation, *Ozone, *Electrolysis, Ion exchange, Heavy metals, Iron, Nickel, Filtration, Flotation, Chromium, Foreign research, Legislation.
Identifiers: *Metal plating wastes, *Cyanide complex ions, Cobalt, Japan.

Industrial waste water treatment is discussed in terms of the removal of harmful substances as defined in Japan's water pollution control law. The most economical and efficient water treatment is one in which the waste water is collected in segregated streams. The waste water from metal plating factories contains highly concentrated cyanide ions which exist as metal cyanide complex ions. Cyanide can be decomposed by oxidation methods such as alkali salt and chloride gas combination, ozone, or electrolytic oxidation. However, iron, nickel, or cobalt containing cyanide waste water cannot be treated by these oxidation methods. An alternative method is the addition of ferrite ion to the water, forming stable insoluble ferrocyanide complexes. The use of ion exchangers for heavy metal removal from the effluents from various chemical industries as well as metal plating factories is an expensive operation. With pH adjustment of waste water, most heavy metals will form water insoluble metal hydroxides which can be removed from the water by filtration or flotation techniques. The pH adjustment of the water must be controlled to avoid the formation of the soluble complex ion of amphoteric metal hydroxide. The waste water containing chromic acid ions should be reduced to free chromium ions which then can be removed from the water in the form of chromium hydroxide. (Katayama-FIRL)
W76-05123

CONTAMINATED WATER PURIF(ICATION).
Belgian Patent 24133W/14. Issued April 22, 1975. Derwent Belgian Patents Reports, Vol. W, No. 19, p 1, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Color, Dyes, *Patents, Water purification, *Chemical reactions, Iron.
Identifiers: Ferric hydroxide, Chemical treatment.

A process for the purification of an aqueous liquid contaminated with colored substances has been patented. The contaminated water which is free from dye complexing retarders, is treated with ferric and/or ferrous ions. This reaction results in the formation of ferric hydroxide which is removed together with the colored substances from the water. (Orr-FIRL)
W76-05126

AIR OXIDN PROCESS OF SOUR WATER.
French Patent 59711U/40. Issued March 21, 1975. French Patents Abstracts, Vol. W, N. 18, p 3, June, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Oil wastes, *Pulp and paper industry, Oxidation, Sulfur compounds, Sulfates, Sulfite liquors, Sulfides.
Identifiers: Liquid phase air oxidation, Petroleum refinery wastes.

A patent has been issued for an air oxidation process which is useful for the treatment of waste water from petroleum refining and paper production. It is specifically designed for the continuous treatment (liquid phase air oxidation) of water containing sulfide anions and one or more other anions selected from thiosulfates, tetrathionates, polythionates, sulfites, and polysulfides. The method comprises: adjusting the pH to 6-13 and heating the water to 121-271 C; oxidizing with a non-catalytic oxidizing medium containing 0-500 percent excess oxygen based on the stoichiometric conversion of sulfide to sulfates at 5.3-56.0 kg/sq cm at a L.H.S.V. of 0.5-12.0 volumes feed/reactor void volume; and, recovering an effluent containing only sulfate anions. (Orr-FIRL)
W76-05127

PURIFICATION OF WASTE WATERS BY FILTRATION THROUGH FINELY DISPERSED ACTIVATED CARBON,
L. A. Puzatkina.
Available from the National Technical Information Service, Springfield, Va, 22161, as ADA-007 861, $3.25 in paper copy, $2.25 in microfiche. Translation FSTC-HT-2 3-0282-75, November 1974. 6 p, 1 fig, 2 tab. Translated from Moskovskii Inzhenero-Stroitelnyi Institut imenii V. V. Kuyby, sheva: Issledovaniya po ochistke stochnykh vod, 71/122-127.

Descriptors: *Activated carbon, *Filtration, *Adsorption, *Water purification, *Waste water treatment, Treatment facilities, Recycling, Filters, Separation techniques, Water quality, Water pollution, Chemistry, Analysis, Liquid wastes, Carbon filters, Suspended solids, Perlite.
Identifiers: Trinitrotoluene, Carbon powder, Cartridge filters, Hydrocarbon removal, Filtering surface, Multi-stage installation, Carbon regeneration, TNT.

A procedure was described for removing trinitrotoluene from wastewater by passing the wastewater through a battery of three successively joined activated carbon filters. The filters were arranged so that any filter could be removed for cleaning by replacing it with a fourth carbon filter in the battery. Before passing to the carbon filters, the wastewater was filtered through a perlite filter to remove suspended solids. The cost of purification of one cubic meter of wastewater by the proposed set-up would amount to 20 copecs without including the cost of carbon regeneration. Purification of wastewaters by other methods would cost not less than 5-10 roubles per cubic meter. (Henley-ISWS)
W76-05167

THE DRY DEEP PIT SYSTEM,
Purdue Univ., Lafayette, Ind.
R. L. Adams.
Poultry Tribune, Vol. 77, p. 26, 28, April, 1971. 2 fig.

Descriptors: *Farm wastes, *Poultry, Odor, Water pollution, Ventilation, *Waste treatment.
Identifiers: *Deep pits, Flies.

Odors, flies, and nutrients in water courses are the typical pollution problems associated with poultry. All can be eliminated by use of a deep (8 to 10 ft.) pit under the poultry house if it is kept dry. Install and maintain a proper watering system. Mechanical ventilation will be required for high-density chicken populations. The pit may never require cleaning. (East Central)
W76-05172

TREATMENT OF DAIRY WASTES BY MECHANISED BIOLOGICAL METHODS,
S. R. Alagarsamy, and B. B. Bhalerao.
Indian Journal of Environmental Health, Vol. 14, No. 3, p. 225-235, 1972. 3 fig, 1 tab, 5 ref.

Descriptors: *Farm wastes, *Waste treatment, *Dairy industry, *Aerated lagoons, *Design, *Costs, Oxidation lagoons, Biological treatment.
Identifiers: *India, *Oxidation ditch, Mechanized biological treatment.

Because wastes from dairy plants are rich in degradable organic matter and exert a high oxygen demand, adequate treatment is necessary. The degree of treatment depends on mode of disposal either into water courses or on land for irrigation. Among the mechanized biological methods available, the aerated lagoon and the oxidation ditch are relatively easier to install and operate. Only partial treatment by aerated lagoon with 1.15 days detention time is sufficient for disposing the final effluent to land for irrigation. An oxidation ditch should be used where the treated effluent is intended to be discharged into water courses. The waste treatment problem of a dairy with large capacity has been considered as a case study and detailed designs and cost studies for aerated lagoon and oxidation ditch methods have been worked out. (Cameron-East Central)
W76-05174

ON THE HORNS OF THE DAIRY WASTE DILEMMA,
F. F. Smith, S. E. Bishop, J. C. Oliver, W. C. Fairbank, and W. W. Wood, Jr.
Western Dairy Journal, Vol. 31, No. 9, p. 10-13, July 1975.

Descriptors: *Dairy industry, *Farm wastes, California, *Regulation, *Costs, Water pollution control, *Recycling, Pollution abatement.
Identifiers: Earth corrals, Recycled Aerated Manure(RAM).

The impact of new requistion on the Southern California Dairy industry is examined. At least eight factors have been found to influence the choice of waste management alternatives -- land values (investment costs); land taxes; cow density (or manure application) limitations imposed by water control agencies; cow density limitations imposed by local governmental planning authorities; production responses attributable to geographical region; production responses attributable to the side effects of waste management facilities (heat, cold, mud, rain, etc.); operating costs; and net revenue realized from cropland used for waste disposal. A method is presented for assessing these variables. The profitability of dairying in Southern California is determined mainly by land values and pollution prevention requirements. A comparison is made of two management systems -- (1) the earth corral and (2) the Recycled Aerated Manure System (RAM), in which cows are maintained in roofed, open-sided structures, with air-dried manure used as absorbent bedding. Waste management investment costs are $167 per cow and $38.50 per cow for RAM and earth corral systems, respectively. 'All other costs' for the year are $760 and $775 for RAM and the earth corral, respectively. RAM provides (1) conditions for c cleaner cows, (2) a more compact layout, (3) a more convenient site for examing and treating cows, (4) better u dder health, (5) fewer foot or leg injuries, and (6) reduction in fly control costs. It is concluded that the RAM system offers a viable and competitive solution for waste management. (Penrod-East Central).
W76-05175

BORON TOXICITY IN RED PINE FOLLOWING MUNICIPAL WASTE WATER IRRIGATION-RUA.
New Zealand Forest Service, Rotorua.
For primary bibliographic entry see Field 5C.
W76-05177

NEBRASKA DOMESTIC AND INDUSTRIAL LIQUID WASTES DISPOSAL RULES.
Nebraska Environmental Control Council, Lincoln.
For primary bibliographic entry see Field 6E.
W76-05219

KANSAS AGRICULTURAL WASTES REGULA TIONS.
For primary bibliographic entry see Field 6E
W76-05220

ALASKA WASTEWATER DISPOSAL REGULA TIONS.
For primary bibliographic entry see Field 6E.
W76-05223

A RATIONAL APPROACH TO DECISIO MAKING IN THE REGIONALIZATION O WASTEWATER TREATMENT SYSTEMS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
D. W. Weeter, and J. G. Belardi.
Available from the National Technical Informa tion Service, Springfield, Va 22161, as PB-250 74 $5.00 in paper copy, $2.25 in microfiche. Researc Report No. SETEC CE 75-018, May 1975, 85 p, fig, 12 tab, 2 append. OWRT A-035-PA(1), 14-3 0001-5038.

Descriptors: *Economies of scale, *Optimizatio *Waste water treatment, *Regional analysi Sewage districts, Planning, *Pennsylvani *Algorithms, *Decision making, Alternative cost Treatment facilities.
Identifiers: Sensitivity analysis, Wastewater co lection, Regionalization.

The concept of regionalization as it applied planning of wastewater treatment and collecti facilities is introduced. Generally, the problem to find the minimum cost alternative for the loc tion and number of treatment plants given a d crete set of wastewater generators. Literatu solutions to the regionalization problem reviewed for possible application to regional are in Southwestern Pennsylvania. Modificatio were made to improve the neuristic algorithm McCouagha and Converse. The improved gorithm was applied to two case study regio Results from the algorithm were compared results obtained by an iterative approach used Southwestern Pennsylvania Regional Plann Commission. Sensitivity analyses performed the improved neuristic algorithm indicate a w range of uncertainty in cost estimation. A conc sion is that a determinatic approach may not very practical for selection of an optimum, or least cost, solution in a regional wastewa system. A more rational method may be the use risk analysis or other stochastic processes. (Si Penn State)
W76-05251

FIELD-LEVEL PLANNING FOR AREAWI WASTE TREATMENT MANAGEMENT: MODEL FOR PLANNING UNDER SECTION OF THE FEDERAL WATER POLLUTION CO TROL ACT,
North Carolina Univ., Chapel Hill. Dept of and Regional Planning.
D. H. Moreau.
Prepared for Triangle J Council of Governme Research Triangle Park, N. C. April 1975. 335 p fig, 28 tab, 105 ref, 8 append.

Descriptors: *Water Pollution Treatm *Regional development, Water resour *Planning, *Alternative planning, *Federal W Pollution Control Act, Water management, W policy, Regional analysis, Environmental effe *North Carolina, Water quality
Identifiers: *Research Triangle Region(N *Public participation, Chapel Hill(NC), ham(NC), Raleigh(NC).

The Research Triangle Area of North Carolina cluding cities of Raleigh, Durham and Chapel was the first area in the U.S. to request designa

planning area under Section 208 of the Federal
er Pollution Act of 1972. This report on that
s study can serve as a guide for similar efforts.
I sets forth a theoretical framework for the
ning process and addresses difficulties of
ting models to real situations. The purposes of
study were: selection of an areawide water
ity management plan consisting of policies and
rams, necessary public agencies, and or-
zational arrangements for making political
sions; undertaking of a public forum for
ssion of the consequences of alternative
th policies; and providing local governments
information related to water quality. The
ning process included discussion of objec-
, surveys of existing systems, establishment
erational goals, generation and testing of al-
tives and evaluation. Several problems are
rent in adapting the established planning
ework to other '208' areas: no single unit of
rnment is responsible for the whole area;
are few explicit policy guidelines; there is no
notion about where growth should occur; and
pollution control techniques are not familiar
nners. Part II lists elements and tasks to be
rmed during execution of the planning
ss. A time schedule of these is given as they
ed in the Research Triangle effort. Specific
lines are included in appendices: pollution
e analysis; data sources; legal, organizational
inancial analyses; and analysis of biological
nts for environmental assessment. (Smith -
n Carolina)
05261

**NSPORT PHENOMENA APPLIED TO
GE DEWATERING,**
Oliver, Inc., Stamford, Conn.
s, and D. D. Adrian.
al of the Environmental Engineering Divi-
Proceedings of ASCE, Vol. 101, No. EE6, p
65, December, 1975. 6 fig, 2 tab, 19 ref.

riptors: *Sludge treatment, *Dewatering,
ation, Sludge disposal, Equipment, Mathe-
al models, Model studies, Hydraulic conduc-
, Pressure, *Waste water treatment, Water
nent.

thematical model for flocculent porous media
en developed. The increase of concentration
dges is due to the increase of effective pres-
which is the major parameter governing the
ntration changes of sludge during the de-
ing process. The application of the mathe-
s of transport phenomena in porous media
d a partial differential equation the to the
ation of effective pressure changes. In
bing a sludge dewatering process, the physi-
aracteristics of the coefficient of linear com-
bility and the hydraulic conductivity must be
red. Voluminous flocculent sludges are
ated in waste water treatment and water
ent plants. The deformation of the matrix of
sludge solids should be similar to the mea-
sludge, and this model should be valid for all
lent sludges and suspensions. This model
so be used to describe the performance of
dewatering equipment in cases where the
ment performance was not clearly described
specific resistance concept. (Kramer-FIRL)
5264

**LARGE-SCALE REGIONAL PLANT
THESIS: DISCRIMINANT ANALYSIS,**
cky Univ., Lexington. Dept. of Economics.
mary bibliographic entry see Field 5G.
5267

**ROBIC FILTER TREATMENT OF PHAR-
UTICAL WASTE,**
ri Univ., Rolla. Dept. of Civil Engineering.
mmett, and N. D. Dennis, Jr.
l Water Pollution Control Federation, Vol.
1, p 104-121, January, 1975. 12 fig, 6 tab,

Descriptors: Chemical industry, *Chemical wastes, *Waste water treatment, Industrial wastes, *Anaerobic treatment, *Filtration, Chemical oxygen demand, Recycling, *Filters.
Identifiers: *Anaerobic filters, *Pharmaceutical wastes.

The anaerobic filter has been applied to various synthetic wastes ranging from acetic acid to protein-carbohydrate substrates. This investigatin determined the treatability of a pharmaceutical waste by an anaerobic filter, evaluated a filter performance for various hydraulic and organic loding conditions, and subjected the filter to shock loading in order to determine the effect on its operation. The waste treated was from a pharmaceutical plant in Springfield, Missouri, and satisfied the prerequisite for treatment with an anaerobic filter: a relatively high COD and low SS. The anaerobic filter was found to successfully treat the pharmaceutical waste at COD concentrations from 1,000 to 16,000 mg/liter, when operated at 35 C with steady state removal efficiencies of 93.7 to 97.8 percent. High treatment efficiencies were achieved and maintained without solids recycle over an organic loading range of 13.8 to 220.0 lb COD/day/1,000 cu ft. The anaerobic filter was operated for six months without the need for solids disposal. Shock increases in organic loadings did not cause a failure in the capability of the filter to treat the waste. The anaerobic filter compares favorably with other waste treatment processes with respect to loads that may be applied and the removals that may be attained. The most significant advantage of the anaerobic filter is the fact that low cellular synthesis rates and long solids retention times enable the anaerobic filter to treat chemical and other wastes efficiently without the need for solids recycle or solids wasting. (Orr-FIRL)
W76-05275

OXIDATION OF ACETONE WITH OZONE IN AQUEOUS MEDIA IN THE TREATMENT OF ACETONE-CONTAINING WASTE WATER (OKISPLIENYE ATSIETONA OZONOM V VODNYKR SKRIEDAHR PRUMIENITIELNO K OBIEZVRIE-JIVANIYOU ATSIETONSODIER-JACHTIHR),
D. S. Gorienko-Giermanov, N. M. Vodopianova, N. M. Haruna, M. M. Gorodnov, and V. A. Zaitsiev.
Khimicheskaya Promyshlennost, No. 12, p 31-32, 1974. 2 fig, 1 tab, 5 ref.

Descriptors: *Ozone, *Waste water treatment, *Oxidation, *Chemical wastes, Costs, Kinetics, Laboratory tests, Industrial wastes.
Identifiers: *Acetone.

The oxidation of acetone with ozone in water was studied under laboratory conditions with respect to the purification of acetone-containing waste waters. The acetone concentration in the water ranged from 100-1,000 mg/liter. Calcium hydroxide was added to achieve quantitative oxidation of the waste water to carbonate and water. The time required for the quantitative oxidation of acetone was found to be a function of the rate of admission of ozone to the reactor and of the initial acetone concentration. The ozone requirement for the oxidation of one g acetone was calculated to be 4.74 g. The calcium hydroxide expenditure amounted to 3.81 kg per kg acetone. The cost of the oxidation at an acetone concentration of 100 g/cu m amounted to 0.26 Rbl per cu m. (Takacs-FIRL)
W76-05277

MERCURY GETS A ROASTING AT CHLORINE PLANT.
Chemical Week, Vol. 116, No. 10, p 32-33, March, 1975.

Descriptors: *Mercury, *Waste water treatment, *Chemical industry, *Chemical wastes, Industrial wastes, Costs, Sludge treatment, Chemical precipitation, Capital costs, Operating costs.
Identifiers: Chlor-alkali plant brine, Mercury cells, Brine-sludge roasting.

A three-year study at Georgia-Pacific's Bellingham, Washington, mercury-cell chlor-alkali plant has determined that high-temperature roasting can remove up to three times as much mercury from chlor-alkali plant brine sludge as any other method. Also concluded was that sulfide precipitation can reduce the mercury content of waste water to 50 ppb. The roasting unit utilized is a 75 sq ft, 4.5 ft inside-diameter, six-hearth furnace made by Envirotech's BSP Division. The unit processes 300-700 lbs of sludge per hour at operating temperatures of 1,000-1,400 F, and is capable of removing 98.3-99.8 percent of the mercury. The capital cost of the system, including collection equipment, a thickener, rotary vacuum filter, furnace and condensers, is $364,500 and operating cost is $35/ton of sludge treated. In addition to the system for treating the sludge, Georgia-Pacific also installed a treatment system for mercury-containing waste process water, collected from floor washings from the cell room, purger streams from the brine system and the cell end-box wash water recycle systems, drainage from caustic filtration and water from tank cleaning. The mercury content of this waste water ranged from 300 to 18,000 ppb. Sulfide precipitation was chosen as the treatment method because of the fewer process steps required, and the facts that the pH treatment necessary helps neutralize the cooling water effluent, precipitated mercury is in concentrated form and can be fed to the roasting furnace without adding significantly to the solids load, and sodium sulfide is inexpensive and leaves no additional contaminating ions after the excess sulfides are eliminated by available chlorine. The capital cost of this system is $143,900 and operating cost is $0.50/1,000 gallons. (Orr-FIRL)
W76-05278

TREATMENT OF WASTE WATER CONTAINING NITRATES.
French Patent FR 2219-910. Issued November 1, 1974. Derwent French Patents Abstracts, Vol. V, No. 52, p D2, February, 1975.

Descriptors: *Patents, *Waste water treatment, *Nitrates, *Evaporation, *Incineration, *Explosives, Chemical wastes, Industrial wastes.
Identifiers: *TNT wastes.

A patent has been issued for a method of treating waste water containing nitrates. The method involves partial evaporation followed by incineration. This incineration treatment of waste water is particularly useful for effluents from the manufacture of T.N.T. The waste water is partially evaporated in a contact vessel where it meets hot gases coming from the incinerator. The concentrate is pumped to the incinerator and enters alongside the burner, which is fed with natural gas. The incoming effluent pours into a perforated bowl at the top of the contact vessel. It then flows drop by drop through the bowl into the contact vessel. The steam and the hot gases pass into a washing tower where they are sprayed by industrial water under pressure. Any uncondensed gases are drawn by a fan up the chimney. The fuel consumption of this method, as compared with earlier processes, is reduced in the proportion of five to one. In addition, the apparatus is very simple and inexpensive. Any free hydrogen sulfide in the T.N.T. effluent is neutralized with caustic soda before being fed into the apparatus. (Orr-FIRL)
W76-05279

INDUSTRIAL OILS, RECOVERY OR DISPOSAL. (LES HUILLES INDUSTRIELLES, RECUPERATION OU ELIMINATION.),
M. Maes.
Machine Moderne, p 38-45, November, 1974. 2 fig, 8 tab.

Descriptors: *Oil wastes, *Industrial wastes, *Reviews, *Waste disposal, Recycling, Ozone, *Waste water treatment, Liquid wastes, Filtration, Powerplants.
Identifiers: *Oil wastes recovery.

A state-of-the-art review on the disposal of used industrial oils is presented, and methods for the regeneration and recovery of such oils are described. Some 15 percent of the used oils collected are regenerated by vacuum distillation for the expulsion of volatile hydrocarbons, and hydrolyzed with sulfuric acid with subsequent filtration and absorption. The recovered oil is processed in a refinery. Some of the used oil collected is incinerated in refineries or in thermal power plants, although most of the used oil is disposed of in sanitary landfills or else in an illegal manner. According to a new method, cutting oil is regenerated by ozonization at a consumption level of 50 g ozone per cu m oil, followed by filter pressing; this permits the recovery of 5 percent fuel oil. In another process the emulsion is broken by means of ferric chloride and polyelectrolyte. While the supernatant oil can be removed easily, the water containing iron salts is treated with sodium hydroxide for flocculation. Lubricating oils are subjected to ultrafiltration for the quatitative removal of insoluble components, using hexane as a solvent. If regeneration is no longer possible, the used oil is refined by decantation and filtration to recover fuel oil. (Takacs-FIRL)
W76-05280

DISPERSING OIL FILMS ON WATER.
French Patent FR 2213-093. Issued September 6, 1974. Derwent French Patents Abstracts, Vol. V, No. 44, p D2, December, 1974.

Descriptors: *Oily water, *Waste water treatment, Industrial wastes, *Patents, Organic compounds, Films, *Oil pollution, *Dispersion, Path of pollutants.
Identifiers: *Oil film dispersants, Petroleum wastes, Coal-tar effluents.

A method for the dispersion of oil films on water is described. The oil film may be formed by petroleum, vegetable, or coal-tar effluents. The patented composition which achieves the dispersion is a solution containing 3-50 weight percent of a nonionic dispersant and at least 75 weight percent of a water-insoluble oxygen containing organic compound. The oxygen containing organic compound may be one of the following: a mixture of 65-95 weight percent mixed 4-13 carbon alcohols, such as butyl, octyl, decyl, isooctyl and/or isodecyl alcohol, and 5-35 weight percent esters of these alcohols, such as the adipates, sebacates and/or phthalates obtained from the overhead vapors formed in alcohol esterification; a mixture of the oxo-bottom products obtained in the preparation of 6-13 carbon oxo-alcohols, such as isodecyl or isooctyl alcohol; or, a mixture of the first and second compound mixtures. The nonionic dispersant is preferably a 16 carbon alkanolanide of fatty acids, ethylene glycol monomethyl ether or a polycarboxylic fatty acid ester. The composition may be used in 10-100 weight percent of oil concentration and is sprayed on the water surface containing the oil film. (Orr-FIRL)
W76-05281

TOTAL--NEW GRASS-ROOTS PLANT FOR THE DUTCH,
D. J. Cooper, and F. H. Fransen.
The Oil and Gas Journal, Vol. 73, No. 6, p 51-54, February, 1975. 3 fig, 1 tab.

Descriptors: *Oil wastes, *Waste water treatment, *Separation techniques, Oily water, Equipment, Water pollution control, Europe, *Treatment facilities.
Identifiers: Refinery waters, *Netherlands.

A new grass-roots oil refinery has been built at Borselle, The Netherlands, on the north bank of the Schelde estuary. The location of the refinery near the Schelde allows the barge shipment of finished products on the inland-waterway system which extends throughout western Europe. It also increases the importance of containing all oil-contaminated waters and treating them before they are released. A schematic picture is presented of the treatment of waste waters at the refinery. The waste waters are segregated into uncontaminated and oil-contaminated streams. The uncontaminated water, mainly rainwater and demineralizer regeneration effluent, is stored in a storm-water retention center, fed under level control to the observation basins, and then released. Two separate collections are made of oil-contaminated waters. One contains water which may be contaminated with leaded oil and the other with non-leaded oil. Each contaminated stream has its own oily water pit, oil-water interceptor separator, and slops-settling tanks. The oil-water separator is a tilted-plate-interceptor type utilizing screw-type pumps to minimize emulsion formation and containing multiple 'Packs' which effect the oil-water separation. After the interceptor treatment, the oily water is sent to the slops-settling tanks where more oil-water separation occurs. The oil is skimmed from the tops of the tanks; crude oil is sent to the crude tanks and leaded oil is pumped to the gasoline storage. The special system for the prevention of groundwater pollution, the treatment of oil-contaminated sludge from the oil-water separators, and the safety features of the storm-water retention and observation basins are also described. (Orr-FIRL)
W76-05282

BIOLOGICAL TREATMENT OF LIQUID TOXIC WASTES, PART I,
A. S Pearce, and S. E. Pearce.
Effluent and Water Treatment JOurnal, Vol. 15, No. 1, p 32, 37, 39, January, 1975. 5 fig, 6 tab.

Descriptors: *Biological treatment, *Liquid wastes, *Steel, Iron, Oil wastes, *Industrial wastes, *Waste water treatment, Toxicity, Activated sludge, Phenols, Bacteria.
Identifiers: *Coke plant effluents, Iron and steel wastes.

Effluents from the iron and steel industry can contain oils, greases, acids and solids, and toxic and noxious substances, such as cyanide, thiocyanide, thiosulfate phenols, cresols, ammonium salts, and sulfides. Biological treatment has been shown to be an effective method of reducing the toxic and noxious components to acceptable levels for discharge. The effluents considered in this paper are associated with the production of coke and contain both free and fixed ammonia, cyanide, thiocyanide, phenols, ferrocyanides, thiosulfates, sulfide, and chlorides, and have an alkaline pH. The various constituents, concentrations and volumes involved and the design parameters and equipment used in the biological treatment of liquid toxic wastes are discussed. Previously used methods of treatment are briefly mentioned. Percolating filters and activated sludge tanks are the primary methods of biological oxidation of carbonization effluents. The actual mechanisms by which the contaminating substances are removed are outlined. Two strains of bacteria have been isolated which are capable of growth on phenol and another strain has been isolated which can grow on thiocyanate. These three strains of bacteria are considered responsible for the degradation of the major part of coke plant effluents. (Orr-FIRL)
W76-05283

EFFLUENT CONTROL IN ZINC BONDERIZING PROCESSES: I. THE RECYCLE OF RINSE WATERS VIA AN ION EXCHANGE PROCESS,
Puricons, Inc., Berwyn, Pa.
F. X. McGarvey, and S. A. Fisher.
Plating, Vol. 62, No. 3, p 231-234, March, 1975. fig, 4 tab, 2 ref.

Descriptors: *Metals, *Industrial wast *Recycling, *Waste water treatment, Zinc, tions, Anions, Alkalinity, Ion exchange, Wa disposal, Cation exchange.
Identifiers: *Zinc bonderizing processes, kahline cleaner rinse waters, Cation excha resins.

Conventional processes for the recycling of phosphate and alkaline cleaner rinse waters f zinc bonderizing entail problems of waste disp and water conservation. Recycle of rinse wa requires that both cations and anions be remo from the water. The two rinse waters, phosphate and alkaline cleaner, have indivi pollution potentials. Recycle of zinc phosp rinse water is accomplished using strongly ac sulfonic acid cation exchange resins; in hydrogen cycle sulfuric acid acts as the regen tive solution. The acidic components in the ca effluent are then neutralized and concentra For recycle of alkaline rinse, effluents from cation column are fed to weak base ion resins a process similar to the zinc rinse recycle is ca out. These ion exchange processes thus const a means of concentrating dilute wastes prod from the rinsing operation of the zinc bonder process. This permits both water recycle an elimination of the pollution potential of both and phosphates. By using a strong acid c exchange resin in the hydrogen form followed weak base anion exchange material, a 75 reduction in waste volume can be achieved good quality waterproduced for reuse in rinsing system. (ORR-FIRL)
W76-05284

PROBLEMS OF GALVANIC WASTEWA PURIFICATION IN CLOSED WATER CY (PROBLEMY OCZYSZCANIA SCIEKOW WANIZERSKICH W ZAMKNIETYM OB WODNYM),
W. M. Dobrowolski, B. Jakuszewski, and J. Grabowski.
Gaz, Woda i Technika Sanitarna, Vol. 49, No 27-32, January, 1975. 4 fig, 7 tab.

Descriptors: *Waste water treat *Laboratory tests, Industrial w Demineralization, *Lecycling, Zeolites, exchange, Metals.
Identifiers: *Galvanic waste water, *Ionites.

Test data from bench studies conducted fro to 1968, using ionites for purification of ga waste waters in closed water cycles presented. The ionites used during the re were Wofatites KPS, F, SBK, SBW, and Ze M and FF 530. Moisture was determined ionites by drying them to constandt weight a Waste water was passed through an ionite s with a 25 cu cm/minconstant velocity. The water was then placed in a container with agent typical for the given ion. The dy exchange capability was determined on th of ion concentration and capacity. To det statistical exchange capability, 5 g ionit flooded with the waste water under study hrs, and calculations were based on the diff between initial solution concentration an sorption in cu dm/kg dry ionite. Regenera chromium in acid waste water, of cationit purification of waste water derived from a processing are discussed. The technologi rification processes concerning salvag water and the salts of copper, nickel, zi chromium are described and illustrate recovery of metals is not economically f since the quantities of metal in auxiliary water are insignificant. An interesting par process is the recuperation of water. For t pose, the auxiliary waste water is direct column filled with cationite linked with a filled with anionite. The water is demine

reagents regenerating the ionites are aqueous ions of sodium hydroxide and hydrochloric The water and some electrolites recovered hen used for supplementing galvanic baths. acs-FIRL)
05285

ORATORY AND PILOT EXPERIMENTS THE ANODIC OXIDATION OF CYANIDE GALVANIZING WASTE WATERS SUCHE IM LABOR UND IM HALB-HNISCHEN MASSTAB ZUR ANODISCHEN DATION DES CYANIDS IN GAL-SCHEN ABWASSERN),
rkelmann, and P. Koppe.
Wasser, No. 24, p 241-270, 1974. 17 fig, 11 6 ref.

iptors: *Metals, *Oxidation, *Electrolysis, e water treatment, *Industrial wastes, , Hydrogen ion concentration, Laboratory Pilot plants, Treatment facilities.
fiers: *Galvanizing waste water, *Cyanides, rolytic oxidation, Anodic oxidation.

lectrolytic oxidation of cyanide in galvanic water was studied in laboratory-scale and cale experiments. Sodium chloride and chloric acid in the form of usedpickling bath added to achieve electrolytic oxidation. A lecrease of the cyanide concentration during itial phase of the electrolytic oxidation to en and carbon dioxide was noted. The c power consumption amounted to 27 g cyanide, while higher values around 37 g were measured during the oxidation of e concentrates. Nonferrous metals were to be separated almost quantitatively on the e electrodes. The specific power consump-creased with decreasing pH value of the well as with increasing initial cyanide con-ion. Sodium chloride, added in the final of the electrolytic oxidation, suppressed un-le secondary reactions, and thus may be reduce the costs of the treatment. The oxidation of cyanide was found to be nically feasible in a narrow concentration Takacs-FIRL)
286

PURIFICATION OF GALVANIC AND R WASTE WATERS BY THE OZONIZA-METHOD (DIE REINIGUNG GAL-CHER UND ANDERER ABWASSER DEM OZONISER-VERFAHREN),
an.
technik, Vol. 66, No. 2, p 101-107, 1975. 3 tab, 20 ref.

lors: *Ozone, *Waste water treatment, rial wastes, *Metals, Oil wastes, Deter-xidation, Iron, Manganese, Nitrates.
rs: Galvanic waste waters, Cyanides.

uses of ozone for the purification of gal-d other waste waters are described. Ozone ent in the detoxification of cyanide-con-alvanic waste waters. Cyanide reacts with form cyanate, a considerably less harm-ound, which is further hydrolyzed to car-ide and ammonium ion at low pH values. nation of nitrogen, carbon dioxide, am-carbonate, and urea was observed during ozonization of cyanide-containing waste or the ozonization of concentrated cya-tions, ozone should be generated from ather than from air. Ozone is used on a for the treatment of waste waters con-anides, phenol, oil residues, detergents, sulfites, and for the oxidation of iron and se compounds, as well as nitrates. FIRL)
7

DECOLORIZE KRAFT BLEACH PLANT EFFLUENTS EFFECTIVELY WITH LOW-COST POLYMERIC ADSORPTION METHOD,
Rohm and Haas Co., Philadelphia, Pa.
S. I. Rock, A. Bruner, and D. C. Kennedy.
Pulp and Paper International, Vol. 17, No. 2, p 66-69, March, 1975. 4 fig, 5 tab, 6 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Industrial wastes, *Waste water treatment, Polymers, *Adsorption, *Color, Capital costs, Operating costs, Effluents.
Identifiers: Amberlite XAD-8, Kraft bleach plant effluents, *Color removal, *Polymeric adsorbents.

A one-step process based on the polymeric adsorbent Amberlite XAD-8 has been developed by Rohm and Haas to remove color from kraft bleach plant effluents. This technique has advantages over the conventional lime or ion exchange methods in terms both of cost and performance. The only limitation to the process is that the stream to be decolorized must have a pH below 3.0; this may be achieved by blending the caustic extraction stream with an acidic chlorination effluent. Spherical beads of porous polymer function as the adsorbent by attracting organics to their surface by van der Waal's forces. The polymeric adsorption system is capable of treating the entire plant effluent, not only the caustic extraction stream. Total effluent decolorization is 90 to 95%, compared to the 70% decolorization achieved by other processes. Capital costs and operating costs for Amberlite XAD-8, massive-lime, mini-lime, and ion exchange treatments are compared. On the basis of total projected operating costs (dollars/sh. ton pulp) the polymeric adsorption process is the most economical. (Orr-FIRL)
W76-05288

ADSORPTION TREATMENT OF KRAFT PULP LIGNIN WASTE WITH SYNTHETIC, POLYMERIC ADSORBENTS, (IN JAPANESE),
National Research Inst. for Pollution and Research, Tokyo (Japan).
M. Komori, T. Nakai, O. Katsuki, and K. Urano.
Kami Pa Gikyoshi, (Journal of the Japanese Technical Association of Pulp and Paper Industry), Vol. 29, No. 1, p 45-52, January, 1975.

Descriptors: Pulp and paper industry, *Polymers, *Adsorption, *Waste water treatment, *Pulp wastes, *Industrial wastes, Flocculation, Activated carbon.
Identifiers: Kraft pulp lignins, *Polymeric adsorbents, Regeneration.

The treatment of kraft pulp lignin waste by adsorption onto five different types of synthetic polymeric adsorbents and two types of activated carbons was investigated. In addition, aluminum sulfate flocculation treatment was studied. The adsorption capacities of the polymeric adsorbents were found to be greater than or equal to those of the activated carbons. The adsorption rates of the polymeric adsorbents were also found to be equal to or more rapid than those of the activated carbons. The large part of the molecule of lignin was not adsorbed by the polymeric adsorbents but was easily removed by aluminum sulfate flocculation. The regenerative capacities of the polymeric adsorbents were demonstrated by the ease of desorption of the lignin by alkaline solution or methyl alcohol. (Katayama-FIRL)
W76-05289

CLOSED SYSTEM FOR WASTE WATER IN METAL SURFACE PROCESSING FACTORY, (IN JAPANESE),
J. Sakagami, and M. Fujii.
Kankyo Gijutsu, (Environmental Conservation Engineering), Vol. 4, No. 3, p 27-34, 1975. 5 fig, 8 tab.

Descriptors: Metals, *Waste water treatment, *Treatment facilities, *Industrial wastes, *Chemical precipitation, Ion exchange, Operating costs, *Recycling, Electrodialysis, Desalination, Evaporation.
Identifiers: *Metal plating wastes, Zero discharge, Metal surface processing, Japan.

A zero discharge/closed waste water system for metal surface processing factories is described. The system of the Japan Electric Company's Kakegawa plant which processes metal plating for telephone equipment consists of chemical treatment for metal recovery, concentration, and production of clean water. The plant waste water is first treated chemically to decompose harmful substances and to precipitate metals as metal hydrates; the sludge produced is disposed of at a mountain or in concrete form. The second process is the concentration of the salts content in the water by electrodialysis. The de-salted water is sent to an ion exchange apparatus producing clean water. The concentrated salt water (200 ppm salts) is sent to an evaporator to crystalize substances. The evaporated water is cooled by a condenser. The clean water obtained through ion exchange and evaporation is recycled to the factory manufacturing process. The plant recycles nearly 100 percent of its waste water: the waste water produced was 1877.2 cu m/month; and, the water recycled was 1853.6 cu m/month. The operational cost for the waste water treatment was reduced by utilizing the closed system from 36 cents to 27 cents for treating one cu m waste water. (Katayama-FIRL)
W76-05290

WATER PURIFICATION TECHNOLOGIES, (IN JAPANESE),
M. Inoue.
Kagaku Kojo, (Chemical Plant), Vol. 19, No. 1, p 82-86, January, 1975. 3 fig, 2 tab, 3 ref.

Descriptors: *Potable water, *Industrial water, *Water reuse, Industrial wastes, Municipal wastes, Pilot plants, Chemical wastes, Chemical industry, Activated sludge, Activated carbon, Electrodialysis, Reverse osmosis, Desalination.
Identifiers: Ethylene manufacturing wastes.

For the conservation of both potable and industrial water, reuse and purification of industrial and municipal waste waters will be necessary in the future in addition to the desalination of sea water. However, these processes are still costly and thus not attractive. Several purification techniques to treat industrial waste water for reuse for industrial purposes are being studied. A pilot plant to purify waste water from an ethylene manufacturing plant was installed and operated experimentally in Kawasaki City, Japan. The process involves activated sludge treatment to remove suspended materials followed by activated carbon treatment to remove dissolved organic compounds. The dissolved inorganic compounds are further removed by an osmotic method and electrodialysis. The quality of this treated waste water has not yet been determined to see if it compares favorably with the quality of raw water sources. (Katayama-FIRL)
W76-05291

WATER QUALITY AND THE TEXTILE INDUSTRY,
Cosgrove (W. J.) and Associates, Inc., Montreal (Quebec).
J. J. Boudreau.
American Water Works Association Journal, Vol. 67, No. 2, p 59-60, February, 1975.

Descriptors: *Pulp wastes, Textiles, *Industrial wastes, *Reviews, *Water quality control, Waste water treatment, *Water reuse, Costs, Water supply, Turbidity, Alkalinity, Recycling.
Identifiers: *Textile industry wastes.

A review is given of water quality problems central to the textile industry. These involve: producing water suitable for the processing pf textile

products; supplying water suitable for boiler feed in power plants; and, preventing corrosion in metal tanks and pipe lines. Many of the textile industry's processes require water of a high grade and known quality. Impurities which must be controlled are classified under turbidity and color, iron and manganese, alkalinity, and hardness. Combined treatment systems for small municipalities and local textile mills are suggested as being practical and economical. Some forms of water reuse will reduce the costs of process water. Appropriate methods forrecycle are dependent upon the costs of water and of effluent disposal, the limitation on water supplies, and the local conditions. Costs of overall water supply and effluent treatment are becoming undifferentiated and the objective of future research should be to determine the degree of water treatment required in the municipal plant that results in the lowest total cost of treatment. (Orr-FIRL)
W76-05292

WOOL SCOUR WASTE TREATMENT.
South African Patent AZ 7309-213. Issued September 20, 1974. Derwent French Patent Abstracts, Vol. V, No. 47, p D4, December, 1974.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Recycling, Detergents, *Polyelectrolytes, Solids removal, Separation techniques, *Flocculation.
Identifiers: *Wool liquor scouring.

A patent has been granted for a process for the purification of waste water from the scouring of raw or slipe wool. The aqueous soap or synthetic detergent solution is treated by removing the partially spent liquor from the scour bowl and adding a dilute aqueous solution of a nonionic or cationic polyelectrolyte. The treated liquor is held in a separation stage to allow flocculation and subsequent solids separation to take place. The separated solids are removed and the clarified liquor is recycled or discharged. (Orr-FIRL)
W76-05293

WASTE-TREATMENT APPLICATIONS OF REVERSE OSMOSIS,
General Atomic Co., San Diego, Calif. Roga Systems Div.
J. E. Cruver.
Transactions of the ASME, Journal of Engineering for Industry, Vol. 27, No.B-1, p 246-251, February, 1975. 4 fig, 6 tab, 5 ref.

Descriptors: *Reverse osmosis, *Waste water treatment, *Industrial wastes, Filtration, Separation techniques, Economics, Costs, Membrane processes, Desalination, Treatment facilities.

Reverse osmosis has two important characteristics which make it useful for both industrial and municipal effluent treatment. The first is its filtration ability, which facilitates the removal of essentially all of the suspended matter, turbidity, bacteria, and viruses in a waste stream. The second is the membrane's ability to separate dissolved organics and salts from water. Reverse osmosis should be used in a waste treatment system when any of the following conditions are met: a reduction in the volume of the waste water or increases in the efficiency of further processing are required; recovery of valuable or reusable materials is possible from the concentrated phase; or, water conservation is required or economical. Reverse osmosis is a feasible method for treating industrial effluents. A 820,00 gpd plant is described that has been designed to treat effluent from a metal processing plant. A variety of water reuse and pollution concentration possibilities exist in the textile industry, where dyeing wastes are rejected well by reverse osmosis membranes. A reverse osmosis filter, consisting of a skinned cellulose acetate membrane wrapped in a spiral configuration, has also been developed for the treatment of oily water from the bilges of ships. Other industrial wastes which may prove to be treatable by reverse osmosis systems include pulp and paper wastes and blowdowns from cooling towers and boilers. In addition, reverse osmosis appears to be uniquely suited for treating municipal waste water for recycling; pilot plant studies in California are detailed. Costs of reverse osmosis waste treatment systems vary according to the feed water characteristics; these variations are discussed. (Orr-FIRL)
W76-05294

MEETING EPA STANDARDS WITH REVERSE OSMOSIS,
Universal Oil Products Co., Del Mar, Calif. Roga Div.
M. Jhawar, and J. H. Sleigh.
Textile Industries, Vol. 9, No. 1, p 60-63, January, 1975. 3 fig, 1 tab.

Descriptors: *Industrial wastes, *Waste water treatment, *Reserve osmosis, *Activated carbon, Treatment facilities, Textiles, Standards, Costs, Color, Recycling, *Water quality standards.
Identifiers: Dissolved solids, *Dye color removal.

The textile industry must soon find the technology which will allow it to meet the EPA standards for effluent discharge. The only two technological approaches that may offer economical solutions are carbon absorption and reverse osmosis. Although carbon absorption requires an expensive capital investment, its operating costs are relatively low. However, carbon absorption will not remove dissolved solids to a sufficient degree to meet EPA standards and most state laws. Reverse osmosis is capable of removing dye colors and 95 percent of the total dissolved solids, and with proper engineering is the lowest cost solution to the textile industry's water pollution problem. The operating costs of a one mgd reverse osmosis system are typically 35-40 cents/thousand gallons of water. If the water is recycled, then the costs of meeting the new water pollution standards can be substantially reduced. Recycling of waste water will reduce the costs of obtaining water for the processes and will also save on fuel costs as the recycled water may be already as much as 50 degrees warmer than the typical raw feedwater. The results of two pilot systems, installed by Roga Division, UOP Company, in textile plants in Pennsylvania and California demonstrated the effectiveness of the reverse osmosis system in removing dissolved solids and dye colors. Although reverse osmosis has been proven a viable method of treating textile plant waste water, it should be remembered that there is no packaged solution equally applicable for every plant. For each given plant the waste treatment system must be custom designed. (Orr-FIRL)
W76-05295

REVERSE OSMOSIS IN INDUSTRIAL WATER TREATMENT,
Permutit Co., London (England).
W. J. Robertson.
Water Services, Vol. 79, No. 947, January, 1975. 3 fig.

Descriptors: *Reverse osmosis, *Metals, *Industrial wastes, *Industrial water, Membrane processes, Economics, *Waste water treatment, Costs, *Recycling.
Identifiers: Electroplating wastes, Metals recovery.

A general review is presented of the use of reverse osmosis in industrial water treatment. Reverse osmosis, RO, is a membrane process in which water is forced through a membrane by pressure, separating the solution into dilute and concentrate parts. The characteristics of the membrane are the important factors. Current membrane systems are asymmetric; the membrane itself is a layer of dense polymer only a few angstroms thick formed on top of a porous substrate in a single casting process. Cellulose acetate membranes are usually around 0.1 mm thick. The aromatic polyami membrane is in the form of a fine hollow fiber wi a diameter of 0.08 mm and a bore of 0.04 mm. C lulose acetate systems are available in vario geometries, such as tubular, flat sheet, spi wound flat sheet, and membranes on porous ro All RO systems are 'clean' water systems a therefore require pretreatment of the water to fed to a RO system in order to permit effecti long term functioning of the membrane. Reve osmosis is used in the production of ultra-p water (resistivity 18 mega-ohms), in the treatm of boiler-feed and process water, for deionizat of water for hospitals, in soft drink manufactu and in electroplating metal recovery. In me recovery, the plating bath drag-out is concentra by passage through a RO system. The object i collect the concentrate which can be passed b to the plating bath directly. This is beneficial b economically and environmentally, as it conser metal and eliminates the pollution that wo occur if the metals were released in the effl (Orr-FIRL)
W76-05296

EXPERIENCE IN TREATING SCOURING FLUENTS,
B. R. Evans.
International Dyer and Textile Printer, Vol. No. 1, p23-24, January 10, 1975.

Descriptors: *Waste water treatm *Electrolysis, *Sludge treatment, Electrodes, dustrial wastes, Coagulation, Temperat Separation techniques.
Identifiers: *Electroflotation, *Wool scou wastes, *Yarn liquors.

Scouring wool and yarn liquors are treated b electro-flotation technique, based on passing voltage currents through the effluent itsel means of metallic electrodes immersed in liquor arranged horizontally along the botto the tank. The electrolytic tank, in addition t electrodes, also contains a sludge removal sy consisting of a mechanical flight-type scrap remove sludge from the surface of the liquor hopper and sludge removal valve to remov heavy sludge components at the bottom o tank. When a low-voltage current is p through the effluent, there is released at the trode surfaces a mass of fine bubbles whic they rise through the liquor, attach themselv particles in suspension, forming a scum on th face. Gas bubbles generated at the voltages mally used are about 0.1-0.5 mm in diamete form an even mat throughout the length o electrolytic tank, providing a very efficient in floating suspended solids to the surface sludge produced in this type of separation s is dependent on the fraction removed b scraper blade as it moves across the top tank. When acid-cracked grease-bearing li originating from an alkaline scour were tr the electro-flotation technique was able to r the grease level to below 200 mg/liter if neut tion was performed first. Wastes from a sc process in which detergent of a non-ionic were used were more difficult to treat. Trea was obtained only with large quantities of lant. This increased the cost of treatmen caused sludge disposal problems. If pH, lant, current density, retention time and te ture were all held within set limits, then succ treatment of these more difficult wastes co achieved at reasonable cost. (Orr-FIRL)
W76-05297

CONTROLLING PH IN WASTE STRE PART I--DESIGNING THE TREAT FACILITY,
Foxboro Co., Mass.
D. L. Hoyle.
Plant Engineering, Vol. 29, No. 2, p 1 January, 1975. 4 fig.

criptors: *Liquid wastes, *Industrial wastes, ıste water treatment, *Treatment facilities, ign criteria, *Hydrogen ion concentration, ıtrol systems, Design standards, Water pollu- control.
ıtifiers: pIon.

urate and efficient control of hydrogen and r ion concentrations is central to the effective tment of liquid wastes. This first article of a -part series on controlling pH in industrial te streams deals with designing the treatment ity. The relationship between pH range and ıtity of reagent required to achieve strong , strong base neutralization is based on a rithmic progression. Therefore, small errors in ge, such as one percent too much or too little, lt in large errors in pH control. Means must be d to compensate for the inevitable errors in ent delivery; process gain must be reduced so the effect of error is lessened. Many of the lems in industry are solved by the application n appropriate control system to the existing ess. In most cases, a minimum of one well- d tank is required to obtain satisfactory per- ance for difficult pH or pIon control applica- . Intermixing and backmixing are important to ıtrol system; backmixing is more important to rate pH control than intermixing. The best to define backmixing for pH control purposes the ratio of the system deadtime to retention of the neutralization vessel. Suitable baffles careful agitator positioning in neutralization ls will prevent a whirlpool effect. Inlets and ts should be located on opposite sides of the alization vessels with the inlet at the top and utlet near the bottom. Variation in the posi- of theinlet and outlet can greatly change the ime. The ideal neutralization vessel should approximately cubic dimensions and be large gh to provide for a retention time of not less three minutes. (See also W76-05299) (Orr- .)
05298

TROLLING PH IN WASTE STREAMS: T II--OBTAINING CONSISTENT RESULTS,
oro Co., Mass.
Hoyle.
Engineering Vol. 29, No. 5, p 75-77, March, 4 fig, 1 tab.

iptors: *Liquid wastes, *Industrial wastes, te water treatment, *Control systems, Mea- ent, Treatment facilities, Design criteria, rogen ion concentration, Water pollution ol, Design standards.
fiers: pH control.

second article in a two-part series on con- g pH in industrial waste streams deals with ing consistent results. The control system, t selection, lagoons, typical system designs, pplications are discussed. In addition to a rly designed process equipment and control n, a well-trained operator is essential for process control and can help to minimize ing costs. The most useful advanced control que is feedforward control. In this que, measurements of process variables are upstream of the neutralization facility and o determine the reagent requirements. The amounts of the reagents are then added y to the influent stream. The best reagents ose are those that have the lowest overall terms of the cost of the reagent, expense of ining the reagent system, and the cost of the es required to use the reagent. A lagoon in- upstream from a stirred neutralization tank very useful. It helps stabilize upsets in in- pH and flow and allows the use of a process ck system instead of the more expensive ward control system. However, a lagoon replace a mixing vessel as part of the con- stem. The use of feedforward control s and applications are illustrated by sche- rawings and graphs. (See also W76-05298) RL.)

W76-05299

METHOD OF ELECTROLYTIC TREATMENT OF WASTE WATER,
M. Ichiki, and I. Masahito.
Canadian Patent 958,373. Issued November 26, 1974. Patent Office Record, Vol. 102, No. 48, p 47, November, 1974.

Descriptors: *Patents, *Electrolysis, *Industrial wastes, *Waste water treatment, Scum, Cathodes, Anodes, Separation techniques.

A new method for the electrolytic treatment of industrial waste water has been patented. The electrolysis is performed by introducing the industrial waste water as the electrolyte into an electrolytic cell equipped with vertically suspended anodes and cathodes positioned horizontally near the bottom of the cell. Scum forms from the electrolysis of heavy metal ions, fats and oil including animal, vegetable and mineral oils and/or various fine, solid floating material. This scum is removed from the upper part of the electrolytic cell; the electrolytically purified waste water is removed from the lower part of the electrolytic cell. (Orr-FIRL)
W76-05300

TREATMENT OF PAPER BOX PLANT EFFLUENTS,
Owens-Illinois, Inc., Toledo, Ohio. (Assignee).
S. A. Hider, J. K. Rogers, and C. W. Wilkins.
United States Patent 3,868,320. Issued February 25, 1975. Official Gazette of the United States Patent Office, Vol. 931, No. 4, p 1645, February, 1975.

Descriptors: *Patents, Pulp and paper industry, *Industrial wastes, Effluents, Flocculation, Metals, Separation techniques, *Waste water treatment, *Pulp wastes.
Identifiers: Starch adhesive effluents, Paper box plant wastes.

A method of clarifying an aqueous, starch adhesive effluent from a paper box plant has been patented. The aqueous flexographic ink effluent containing about 40 to 50 percent by weight maleic or acrylic vehicle is combined with 15 to 40 percent by weight pigment to form a mixture containing about 8 to 12 parts starch solids to one part ink solids. The resultant mixture is flocculated with a multivalent metal compound. The metal compound is chosen from the group consisting of calcium oxide, calcium hydroxide, calcium chloride, magnesium oxide, magnesium hydroxide, aluminum sulfate or ferrous sulfate. The selected compound is added in a weight ratio of 0.1 to 1.0 parts compound to one part ink-starch solids. The final step involves separating the flocculated solids that have formed. (Orr-FIRL)
W76-05302

BIOCHEMICAL AND CHEMICAL OXYGEN DEMANDS OF CARBOHYDRATES WITH DIFFERENT DEGREES OF POLYMERIZATION,
Swedish Forest Products Research Labs., Stockholm.
S. A. Larsson, B. A-L. Ostman, and E. L. Back.
Environmental Science and Technology, Vol. 9, No. 2, p 160-162, February, 1975. 2 fig, 1 tab, 12 ref.

Descriptors: *Chemical oxygen demand, Pulp and paper industry, *Biodegradation, *Waste water treatment, Polymers, *Biochemical oxygen demand, *Pulp wastes, Oxidation, *Carbohydrates, Industrial wastes.
Identifiers: *Polymerization.

The rapid biochemical degradation of carbohydrates, such as a high BOD in effluents from pulp and paper industries, may be a disadvantage in that it causes a rapid lowering of the oxygen content of the water system near the mill. However, it may also be an advantage in that less time of treatment is required when aerated ponds or activated sludge treatment are used. The biochemical and chemical oxygen demands of carbohydrates have been demonstrated to depend on the degree of polymerization. Monosaccharides are degraded more rapidly and have a higher BOD5 per unit mass than polysaccharides. This lag in the BOD between disaccharides and their monosaccharides is due to the existence of the bond holding the two monosaccharides. The objective of this paper was to illustrate the differences in BOD by an analysis of the biochemical and chemical degradation of some pure components of pulp and paper effluents. A comparison of xylose with a xylan from birch (DP 200) and galacturonic acid with polygalacturonic acid (DP 80) was made. The polymers have a lower and slower BOD and a lower COD, particularly if the COD is determined by the permanganate method. The dichromate method gives a higher degree of oxidation and is less dependent on the molecualr weight. (Orr-FIRL)
W76-05303

FIGHT FLOATABLES WITH CHEMICALS,
Gannett, Fleming, Corddry and Carpenter, Inc., Harrisburg, Pa. Applied Science Group.
A. C. Gray, Jr.
Water and Wastes Engineering, Vol. 12, No. 1, p 33-38, January, 1975. 2 fig, 2 tab.

Descriptors: *Separation techniques, *Oil wastes, *Oil industry, Industrial wastes, Food processing industry, Metals, *Waste water treatment, Activated carbon, Coagulation, Chemical precipitation, *Flotation.
Identifiers: Grease, *Dissolved air flotation.

The three major producers of oil- and grease-containing waste waters are petroleum refineries, metals manufacture, and food processors. All of these industries face problems of how to handle their floatables. Only a limited amount of oil and flotables can be handled by municipal treatment systems, necessitating that pretreatment be performed by industry. The number of methods in use for the removal of oil and grease compounds include mechanical skimming after quiescent detention for removing the free oil, and chemical, biological, and physical mechanisms for the removal of soluble oil. Selection of a treatment process involves considering the effluent quality desired, treatment systems which will follow oil and grease removal, additional contaminants which must be eliminated from the wastes, and relative costs of the applicable system. Chemical coagulation, with activated carbon adsorption in some cases, together with dissolved air flotation of the coagulated solids is one flow scheme which is finding increasing application in the treatment of oil and grease containing industrial wastes, both for pretreatment and direct discharge. The most commonly used coagulants in waste treatment are lime, aluminum sulfate, and ferric chloride. Most of the heavy metals, currently of prime concern, can be removed with lime as the precipitating reagent. However, cadmium and mercury removal may require the addition of sodium sulfide, while lead removal seems to require the use of soda ash. Since coagulation of oil and grease containing wastes often results in the formation of a floc which settles slowly or has a tendency to float, flotation has been demonstrated to be a good method of clarification. (Orr-FIRL)
W76-05305

OIL-WATER SEPARATOR.
For primary bibliographic entry see Field 5G.
W76-05306

MIXED-MEDIA FILTRATION OF OILY WASTE WATERS,
Neptune Microfloc, Inc., Corvallis, Oreg.
R. H. Evers.

Journal of Petroleum Technology, Vol. 27, No. 2, p 157r163, February, 1975. 9 fig, 5 ref.

Descriptors: *Filtration, *Waste water treatment, *Oil wastes, *Oil industry, Filters, Design, Equipment, Coagulation.
Identifiers: *Mixed-media filtration, Petroleum industry.

The petroleum industry is concerned with improving the quality of injection waters in secondary recovery operations and with reducing the biochemical oxygen demand, oil, and suspended solids levels in refinery waste waters. The development, uses, and application to the petroleum industry of mixed-media filtration are discussed. A mixed-media filter uses three or more materials, each of different size and density, that intermix, rather than stratify, to form a filter grading from coarse at the top to fine at the bottom in the direction of flow. A typical mixed-media filter will contain anthracite coal, silica sand, and garnet sand. Mixed-media filtration has been used to purify oilfield produced water, oil refinery wastes, ballast waste from cargo oil tankers, and other systems containing oil. The design of the mixed-media filter system for oily wastes depends on influent oil content, influent suspended solids content, desired effluent quality, temperature, space, and dependability of treatment. An advantage that mixed-media provides is that the size and quantity of wash filter material can be varied to meet the requirements of any particular situation. One of the major problems with the filtration of oily wastes is media fouling or 'mudballing.' This problem can be minimized by the use of a supplementary surface wash during the backwash cycle. Mixed-media filter systems have been shown to be effective in oily waste water filtration. Depending upon the particular waste water to be treated, the individual media sizes and filter depth can be varied, and the effect of chemical coagulants can be considered in the design of the system. (Orr-FIRL)
W76-05307

WASTE WATER CONTAINING SULPHIDE.
French Patent FR 2218-792. Issued October 18, 1974. Derwent French Patents Abstracts, Vol. V, No. 50, p D2, January, 1975.

Descriptors: *Sulfides, *Waste water treatment, *Oil, *Patents, *Oil wastes, *Industrial wastes, Waste disposal, Oxidation, Hydrogen sulfide, Organic compounds, Separation techniques.

The patented method described was designed for the treatment of waste water containing sulfides. The waste water is mixed with a hydrocarbon film in a weight ratio of 0.1 to 6.0. It is then partially oxidized with an oxygen rich gas in the reaction zone of a free-flow non-catalytic synthesis gas generator at 1500-3500 F and 1-250 atmospheres pressure. This yields an effluent of hydrogen, carbon monoxide, carbon dioxide, and water with minor amounts of H2S, CH4, N2, COS, and C particles. The preferred next step is to separate the carbon particles and recover the H2S from the synthesis gas leaving the separator. This process may be used to treat sour water and other water residues from petroleum refining and petrochemical manufacture. Disposing of the sulfide-free water into lakes and rivers causes less pollution than is associated with processes that strip sulfides from the water by air, steam or by oxidation to S203(2-). There is also less air pollution associated with this process. An additional benefit of the method is the destruction of PhOH. (Orr-FIRL)
W76-05308

REMOVAL OF HEAVY METALS FROM AQUEOUS SOLUTIONS,
A. E. Hatch.
United States Patent 3,859,210. Issued January 7, 1975. Official Gazette of the United States Patent Office, Vol. 930, No. 1, p 432, January, 1975.

Descriptors: *Patents, Metals, *Industrial wastes, *Mercury, *Polyelectrolytes, *Waste water treatment, Separation techniques, *Heavy metals.

A process for removing mercury from aqueous streams has been patented. The aqueous stream to be treated may contain mercury in ionic or in compound form. The initial step involves mixing the aqueous stream with a polyelectrolyte and particulate matter. The polyelectrolyte is selected from the group consisting of a polyalkylene polyamine and polyethylenimine and the particulate matter is chosen from the group consisting of a bentonite clay and sand. The mercury is then allowed to become bound to the particulate matter. The final step involves separating the particulate matter containing the mercury from the aqueous stream. (Orr-FIRL)
W76-05309

MANAGING INDUSTRIAL WASTE DISPOSAL,
Westinghouse Electric Corp., Pittsburgh, Pa.
B. A. Kerns, and W. G. Vaux.
American Machinist, Vol. 119, No. 1, p 46-49, January, 1975. 7 tab.

Descriptors: *Waste disposal, *Water pollution control, *Metals, *Industrial wastes, Solid wastes, Liquid wastes, Chemical wastes, Sludge treatment, Economics, Treatment facilities, Management.
Identifiers: *Waste management systems.

Westinghouse has designed a program to eliminate all forms of pollution at its plants and laboratories. Treatment of the company's solid and liquid wastes are the primary goals. These wastes include 51,000 tons of rubbish/year; 38,900 tons of metal scrap/year; 7,460 tons of paper/year; 5,480 tons of wood/year; 3,200 tons of lube and insulating oils/year; 2,600 tons of solvents/year; 2,130 tons of chemical sludge/year; and smaller amounts of cutting fluid, plastics, glass, PCB, and chemicals. The study is divided into three phases: Phase I is a comprehensive survey of all wastes from all plants; Phase II is a survey of existing and practical waste disposal methods; and, Phase III is a detailed evaluation of the most promising waste disposal methods and coordination of eventual treatment within and between regional plants. The preferred methods for handling the various wastes at Westinghouse Plants follow. Scrap metal is currently being sold on bid and this disposal method should remain the same. Dry chemicals are currently being disposed of by a licensed hauler on special pickups, this method should also remain unchanged. Scrap glass totals 75 tons annually. It is not practical to recover this and the glass should be included in the rubbish. Chemical sludge which results from treatment of metal finishing waters is presently too watery and should therefore be thickened and then disposed of at an approved landfill site. Conclusions from the study so far include: present disposal methods are not the most economical on a dollar or resource recovery basis; improved methods are available for improved disposal; waste disposal is primarily a management decision; and disposal of all waste must be considered as a total system. (Orr-FIRL)
W76-05310

WASTEWATER TREATMENT SYSTEM IN STEEL MILLS, (IN JAPANESE),
Y. Komatsu, S. Matsuno, and H. Fujita.
Hitachi Hyoron, (The Hitachi Hyoron), Vol. 56, No. 10, p 91-96, October, 1974. 11 fig, 1 tab.

Descriptors: Steel, *Industrial wastes, *Waste water treatment, *Recycling, *Filtration, Sedimentation, Treatment facilities, Water reuse, Filters.
Identifiers: Japan, *Steel mill wastes.

Described is a waste water treatment system used in steel mills in Japan. Because of the large volume of water used, from 100 to 200 cu m per ton of blister steel, it has been customary for a steel to own a waste water treatment system which vides for the reuse of the waste water. described treatment system for waste water fr continuous caster is finding wide applicatio steel mills. A highly recommended process waste water treatment consists of a combin of natural sedimentation and high speed filte Therefore, a high speed filter and a travelling transversing type pump-up collector are ployed. In an experiment using prototype ment system of this type, very satisfactory re were obtained with respect to system formance. (Orr-FIRL)
W76-05311

TREATMENT OF WASTE OIL AT THE KE WORKS--NIPPON KOKAN,
Keihin Works, Kawasaki (Japan).
T. Ikehata.
Iron and Steel Engineer, Vol. 52, No. 1, p February, 1975. 5 fig, 3 tab.

Descriptors: *Oil wastes, Steel, *Centrifug Water pollution, *Oil pollution, Liquid w Sludge treatment, Treatment facilities, ment, Industrial wastes, *Waste water treat Water quality standards.
Identifiers: *Japan, *Steel plant wastes.

Steel plants are potential sources of serious tion problems because of the offensive gases and large quantities of waste water produc well as many other wastes. The treatment of oil by incineration at the Keihin works of N Kokan of Japan is discussed. Topics includ regulations covering waste oil treatment, the policy of the Keihin works, the generation waste oil from various parts of the work waste oil treatment facilities, features of the ties, and some of the problems in waste oil ment. The waste oil treatment facilities con the following: a liquid waste oil receivi preparation center which comprises a cent separator and a stationary separating t dehydration plant for emulsion waste oil dehydrated cake and ash; mixing and ch facilities for oily sludge, dehydrated scum and cinders; a rotary incinerator and sec combustion furnace; a fume scrubbing syst ash bunker; and, waste gas treating facilitie prising a gas cooler, electrostatic precipita blower. This system can easily treat waste a high water content because of the dehy equipment. For the treatment of sticky oil mixing with ash is an advantage. This syste eliminates secondary pollution; water separ the course of waste oil treatment and wate the waste gas cooler can not be discharged the works. A highly efficient, large capacity trial waste treatment plant has been in op since May 1973 at the Fukuyama works of Kokan. The plant was developed bas technology acquired at the Keihin works FIRL)
W76-05312

PURIFIER ESP. FOR ELECTRO PLATI FLUENT WATER.
French Patent FR 2216-233. Issued Oct 1974. Derwent French Patents Abstracts, No. 48, p D3, January, 1975.

Descriptors: *Patents, *Waste water tre *Metals, *Industrial wastes, Equ Recycling.
Identifiers: *Electroplating wastes, *Batc ment tanks, Cyanides.

The patented equipment described is a designed especially for use with electropl fluent water. The effluent water from troplating plant is treated to remove acid c along with other contaminants, in a batc ment tank. The treatment tank has a short about ten minutes and a low capacity. A

k is filled from a sump, under level control, a
np is actuated to recycle water from the bottom
he top of the tank. The recirculation occurs via
strictions which induce the flow of additive re-
nts, such as NaOH, H2SO4, and Caro's acid,
er pH and rH control. When the purification
e is complete, another pump is actuated to
ty the tank. The treated water is released to a
nage system. Surges in contaminant concen-
on, such as those due to process tank over-
, are more effectively accommodated with the
equipment than with continuous purifiers.
-FIRL)
-05313

MPLETE WATEREUSE, INDUSTRY'S OP-
TUNITY.
erican Inst. of Chemical Engineers, New York.
onal Conference on Complete WateReuse
l 23-27, 1973, 728 p. Sponsored by: AICHE
Environmental Protection Agency, Washing-
D.C. Technology Transfer. Edited by
rence K. Cecil.

criptors: *Water reuse, *Waste water treat-
, Legal aspects, Water pollution control,
ter quality standards, Technology, Waste
osal, *Ultimate disposal, *Cost-benefit ratio,
er management(Applied), Administration, In-
ies, Benefits.
tifiers: *Zero discharge, *Technology
fer.

conference included sections on: a general
view of water reuse, especially the meaning of
discharge; legal aspects of recent Federal
r pollution legislation standards, and laws; fu-
technology; waste disposal and ultimate
sal; the electric power industry; chemical
facture; petroleum, pulp, paper and
oes; the cost/benefit ratio; reuse in water
gement; and water administration benefits
reuse. (See W76-05315 thru W76-05318.)
05314

RATIONALE OF ZERO DISCHARGE,
. Parsons, and H. S. Azad.
omplete WateReuse: Industry's Opportunity,
23-27, 1973, American Institute of Chemical
neers and Environmental Protection Agency--
nology Transfer, p 34-36. 1 fig.

riptors: *Discharge(Water), *Water utiliza-
Water pollution control, Water pollution,
e assimilative capacity, Natural resources,
r quality standards, Water pollution sources,
, Water reuse.
fiers: *Zero discharge.

ugh the concept of zero discharge is not new,
plication is original and is a subject of critical
ation from the standpoint of consistency with
nmental goals and federal funding. Factors
buting to the realization of a full measure of
t from expenditures committed to waste
control are reviewed. Water pollution is the
tion of the assimilation capacity of a water-
e. Assimilation capacity is a natural resource
r to solar energy, water supply or mineral
ts. Use of the assimilative capacity should
e considered evil if obtaining the fullest
, wealth and enjoyment is the goal. The most
nt pollution programs will prosecute all
s of pollution simultaneously so that equal
ost of pollution removal is effected. Pro-
of proven practicality should be chosen
ostly installations of unproven reliability.
discharge can be applied to situations in
water quality criteria is sublime, the waste
ent is a severe problem, or waste heat is a
m. However, it is not a viable concept in a
m featuring cost optimization. Secondary
on the environment should be evaluated.
ments of existing legislation are needed to
the adoption of policies consistent with na-
goals of conservation of natural and
economic resources. The benefits are a more rapid alleviation of problems at minimum cost. (See also W76-05314) (Pinto-FIRL)
W76-05315

CLEARING UP THINKING ON POLLUTION LAWS,
For primary bibliographic entry see Field 5G.
W76-05316

HANDLING OF SOLIDS AND LIQUID SIDESTREAMS RESULTING FROM WATEREUSE OPERATIONS,
Canys, Dresser and McKee, Inc., Boston, Mass.
A. A. Kalinske.
In: Complete WateReuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer, p 140-146. 25 ref.

Descriptors: *Water reuse, *Waste water treatment, *Waste treatment, *Ultimate disposal, *Water treatment, Activated sludge, Organic matter, Activated carbon, Treatment, Trickling filters, Sands, Filtration, Dewatering, Treatment facilities, Ion exchange, Chemical precipitation, Oxidation, Sludge, Cost analysis, Municipal wastes.
Identifiers: *Liquid sidestreams.

Waste water treatment processes should be considered as one step of water treatment processes. The eventual disposal of the solid and liquid pollutants and residues that are removed by various treatment processes are discussed. The basic ultimate disposal processes are discussed. Biological treatment by means of the activated sludge process can remove considerable amounts of biodegradable organic matter. The exact amount depends on the food to microorganism ratio and the type of organic matter that is present. Other methods include a rock trickling filter, rotating disc contactor and an aerated packer tower. Another process that reduces organic matter is adsorption onto activated carbon. The rapid sand filter has been used by municipal water treatment plants for almost seventy five years, and the basic design has remained unchanged. Chemical precipitation can be used to remove soluble inorganics. Ion exchange and membrane technology are other good methods for separating soluble matter. Chemical oxidation includes such methods as incineration of dewatered organic sludges or liquids, wet air oxidation of organic bearing liquid sidestreams and the removal of small amounts of soluble organics by ozone. Whatever treatment system is decided on, it is necessary that a detailed cost analysis be performed and the total cost must be obtained so that it may be compared to other possible methods. Other techniques that are being considered for the future include incineration of soluble organics in liquids, catalytic oxidation, hydrolysis of organic sludges, and the use of magnesium carbonate for coagulation. (See also W76-05314) (Pinto-FIRL)
W76-05317

MUNICIPAL WASTEWATER RECLAMATION--AN INDUSTRIAL WATER SUPPLY,
Dallas Reclamation Research Center, Tex.
A. C. Petrasek, S. E. Esmond, and H. W. Wolf.
In: Complete WateReuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer, p 689-703. 2 fig, 12 tab, 9 ref.

Descriptors: *Municipal wastes, *Industrial wastes, *Industrial water, *Reclaimed water, *Reclamation, *Water reuse, Treatment, Waste water treatment, Treatment facilities, Activated sludge, Activated carbon, Biological treatment, Effluents, Water requirements, Potable water.
Identifiers: Chemical treatment, Physical treatment.

Considerable reuse of municipal waters by industry is practiced at this time. Industrial water supply problems and requirements are reviewed. Water quality depends a great deal on whether it will be used as a coolant or as boiler feed. If used for cooling the waters must not deposit scale, corrode the systems, encourage the growth of slime, or deteriorate wood. Water used for boiling must be free from silica, aluminum, sodium, and potassium. Specific requirements are presented for the textile, lumber, paper, chemical, petroleum, metals, tanning, cement, and food and soft drink canning industries. Tests were performed at a treatment facility on two different treatment sequences. The biological-physical sequence included the following operations: screening and degritting; primary sedimentation; completely mixed activated sludge; multi-media filtration; and disinfection. The biological-physical-chemical sequence included: screening and degritting; primary sedimentation; completely mixed activated sludge; chemical treatment; multi-media filtration; activated carbon adsorption; and disinfection. Primary effluents, although not of high quality, have certain applications as cooling waters and in the lumber and metals industry. Activated sludge effluent can be used in the lumber, petroleum, metals, cement, and paper industries. When filtered, this water can be used also in the tanning industry. After filtering, this water can be used in finishing and rinsing processes. After activated carbon adsorption, the effluent is considered of excellent quality and the water can be used for all industries except those requiring potable water. (See also W76-05314) (Pinto-FIRL)
W76-05318

UPGRADING WASTEWATER STABILIZATION PONDS TO MEET NEW DISCHARGE STANDARDS.
Utah Water Research Lab., Logan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-240 402,$7.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/9-75-004, (March 1975), 244 p (Proceedings of a symposium held in November 1974). EPA 1BB043 (21ASR-119) R-803294-01-0.

Descriptors: *Waste water treatment, *Water quality standards, *Oxidation lagoons,*Filtration, Sewage treatment, Disinfection, Infiltration, Cost analysis, Algae, Waste disposal, Sprinkler irrigation, Lagoons.
Identifiers: -Sand filtration, Controlled discharge(Wastes), Rock filtration, Land disposal.

The question as to whether lagoons, as they now exist, meet the new secondary treatment standards and what methods would work to upgrade lagoon treatment in cases where they presently do not meet the standards is of high priority for many Regional Offices of EPA. The symposium was held for EPA staff and State Officials to review the Office of Research and Development's program for upgrading lagoons. The intermittent sand filter, land application of algae laden effluents and the submerged rock filter offer good potential for cost effective upgrading. The basic biology of the treatment mechanism, disinfection technology, the controlled discharge operation (and results), cost effective analysis, and new fields of research were covered. Intermittent sand filtration, submerged rock filtration, and land application of sewage effluents are effective alternatives to removing algae from sewage lagoons. (See W76-05320 thru W76-05324) (EPA)
W76-05319

CONSTRUCTION PROCEDURES AND REVIEW OF PLANS AND GRANT APPLICATIONS,
Brown and Caldwell, Walnut Creek, Calif.
W. R. Uhte.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 21-29.

Descriptors: *Construction, *Lagoons, *Oxidation lagoons, *Waste water treatment, Stabilization, Design criteria, Engineering personnel, Ponds, Design, Operation and maintenance, Maintenance.
Identifiers: Design engineer, *Stabilization ponds.

General problems connected with waste water stabilization ponds and the design, construction, and operation considerations which are involved in federal and state review are discussed. Problems can arise when oxidation ponds are not designed properly, are not operated and maintained properly, and are not budgeted for and funded properly. Design considerations are the responsibility of the design engineer. Loading levels should be flexible to assure excessive summer organic loadings and winter hydraulic loading. Properly designed pond configuration involves recycling from four to eight times the average design flow into the system. Inlet and outlet hydraulics should be designed for peak wet weather flows. The system should be designed so that areas where scum tends to accumulate are eliminated. Pond and channel dikes are usually best when designed with side slopes between 6 horizontal to one vertical and 2 horizontal and one vertical. Boat launching ramps with all weather access, wash and toilet facilities, and laboratory and monitoring facilities should be built. For the construction of a pond, the contractor must be provided with a clear and concise set of drawings and specifications which complement each other. The design engineer should have the full responsibility for the resident engineer and the inspection of the project. The design engineer should provide an operation and maintenance manual which describes: the treatment processes; the physical layout; process testing; maintenance requirements; safety restrictions; and emergency procedures. Operation training programs, performance evaluations and user charges and self sufficiency may also be required of the design engineer. (See also W76-05319) (Pinto-FIRL.)
W76-05320

SEPARATION OF ALGAE CELLS FROM WASTEWATER LAGOON EFFLUENTS BY SOIL MANTLE TREATMENT,
Utah State Univ., Logan. Div. of Environmental Engineering.
R. A. Gearheart, and E. J. Middlebrooks.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 137-186. 6 fig, 24 tab, 204 ref. 1 app.

Descriptors: *Sewage treatment, *Waste water treatment, *Lagoons, Effluents, *Algae, *Soil treatment, Soil filters, Water quality standards, Stabilization, Planning, Biochemical oxygen demand, Toxicity, Ponds, Land, Irrigation, Cost analysis, Crops, Utah.
Identifiers: *Soil mantle treatment, Land planning, Utah Water Quality Standards.

A review of the history of sewage disposal by waste water irrigation or soil mantle disposal of lagoon effluent is presented. An experimental design of a soil mantle disposal system is described. The limitations of pond effluent used as irrigation water for crops were investigated. Land planning techniques to make ponds more visually pleasing are studied. The difference between Class C and Class D Utah Water Quality Standards are given. The most significant difference is in the 5 day biochemical oxygen demand (BOD(5)). Class D is 25 mg/liter and Class C is 5 mg/liter. Class C standards in general cannot be met by waste stabilization ponds. Economically, they are very feasible, so another means of disposing of the effluent is suggested, irrigation. Waste stabilization pond depth, detention time, shape, mixing and loading are discussed. Too often, land planning has been neglected. It should be based on the nature of the site, and the human purposes for which it will be used. Planning techniques should account for odor, mixing by wind action, insects, type of site, water table depth, and topography. The use of natural berms and trees to reduce odors and attract insect eating birds should be considered. The beneficial or toxic effects of salinity, alkalinity, and other elements are discussed. Water quality factors in relation to specific crops are summarized. Land requirements for effluent discharge are also considered. Some case histories on the use of effluents for irrigation are briefly presented. (See also W76-05319) (Pinto-FIRL.)
W76-05321

LAGOON EFFLUENT SOLIDS CONTROL BY BIOLOGICAL HARVESTING,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
W. R. Duffer.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 187-190. 14 ref.

Descriptors: *Lagoons, *Suspended solids, Biocontrol, *Waste water treatment, Algae, Phytoplankton, Bacteria, Fish, Carp, Minnows, Channel catfish, Mollusks, Zooplankton, Food chains, Stabilization, Daphnia, Organic wastes, Aquatic life.
Identifiers: Talapia nilotica, *Biological harvesting, Bivalve mollusks.

Aerobic bacteria and algae are responsible for the stabilization of organic wastes in lagoons. Research has concentrated mostly on improving production of algae and phytoplankton, resulting in increased suspended solids concentrations, instead of trying to increase the bacteria population to consume the algae. Accomplishments of several studies oriented toward removal of phytoplankton by other aquatic organisms are reviewed. Problems associated with this biological harvesting are discussed, and research areas are suggested. Three types of organisms have been investigated: zooplankton, bivalve mollusks, and fish. Experiments that were performed using the zooplankton Daphnia indicated good suspended solids removal. Since the occurrence of this organism is very uncommon in waste water ponds, culture ponds requiring rigid control and extensive management must be considered. Experiments performed with bivalve mollusks have shown algae removals of up to 85%. The use of cultured fish, mostly carp, in China has been practiced for centuries as a method of purifying waters. Various efforts in the United States included the use of carp, fathead minnows, fingerling channel catfish, golden shiner minnows, and Talapia nilotica. The best approach to date for the removal of solids in oxidation ponds has been the food chain concept. Larger scale systems must be experimented with. Additional research efforts should include: extent of selective solids uptake; examination of a greater number of species; taking a multi-species approach; study of seasonal aspects; productivity of culture systems; and the potential for problems. (See also W76-05319) (Pinto-FIRL.)
W76-05322

PROGRESS REPORT: BLUE SPRINGS LAGOON STUDY, BLUE SPRINGS, MISSOURI,
Environmental Protection Agency, Kansas City, Kans. Water Quality Lab.
C. M. Walter, and S. L. Bugbee.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 191-197. 9 tab, 1 ref.

Descriptors: *Lagoons, Permits, *Regulation, Legislation, Standards, Suspended solids, Biochemical oxygen demand, Coliforms, *Waste water treatment, Chemical analyses, Sands, Filters, *Missouri, Federal Government, Discharge(Water), Water quality standards, Sewage treatment.
Identifiers: Blue Springs(Mo), Fecal colifor Three cell series operated lagoon, Federal W Pollution Control Amendments, National Po tant Discharge Elimination System.

The Federal Water Pollution Control Amendm were passed in 1972. They provided the legisla for controlling the discharge from municipal industrial waste sources. Permits granted u the National Pollutant Discharge Elimina System require secondary treatment by Standards are 30 mg/liter for 5 day biochemica ygen demand (BOD(5)), 30 mg/liter for suspe solids, and 200 organisms/100 ml for coliform sities. These standards were tested for the t cell, in a series lagoon system at Blue Spr Missouri. The objectives of the tests were determine the performance of a three-cell, operated, lagoon; to determine the relative formance of the three cells; and to determin feasibility of slow sand filtration. Two sand were used for the tests, one with an effective size of 0.3 mm and the other, 0.22 mm. Labor analyses were conducted for biochemical ox demand, chemical oxygen demand, suspe solids, nitrogen, phosphorus, coliforms and ous metals. During the winter, 84% of the BO removal occurred in Cell 1 and none in cells 2 Cells 2 and 3 reduced COD and suspended by 32% and 23%, respectively. The fecal col count was reduced from 475,000 to 22,000 c isms/100 ml. In the spring, BOD(5) remova 88%. BOD(5) and suspended solids concentra both met the secondary treatment criteria, the coliforms were in excess of the limit. Da the summer were in the process of generated. (See also W76-05319) (Pinto-FIRL
W76-05323

COST-EFFECTIVENESS ANALYSIS WATER POLLUTION CONTROL,
National Environmental Research Center, C nati, Ohio.
R. Smith.
In: Upgrading Wastewater Stabilization Po Meet New Discharge Standards, August 1974, Logan, Utah, Utah State University, 226. 20 fig, 20 ref, 2 append.

Descriptors: *Cost analysis, *Economics, pollution control, *Analysis, Design, Trea Waste water treatment, Mathematical Cost comparisons, Planning.
Identifiers: Cost-effectiveness analysis.

Over the last ten years, the Environmental tion Agency has shifted its emphasis fro purely scientific aspects of pollution contro study of design and cost-effectiveness. Th cept of cost-effectiveness is very closely rel that of best practicable treatment which wa as a goal to be reached in 1983. The conc cost-effectiveness is discussed. All feasibl natives to achieving the required level of tre should be evaluated and cost analyzed. Oth siderations besides cost may include: expec sidential and industrial growth; infiltration flow impact on the treatment facilities; treated waste water in industry or agri least costly treatment process; factors s sludge retention time, hydraulic detentio water temperature and final settler overflo the impact on improved methods of operat maintenance on effluent quality; and the tion of storm water facilities with dry wat ment facilities. Cost-effectiveness guidelin no allowance for inflation in wages, power capital cost. In order to make a cost comp stream of costs must be converted to one bases: present worth, or lump sum expend the beginning of a planning period; future at the end of a planning period; or continuo flow at a fixed rate. Conversion equations grams are presented. Cost-effective analys plied to a proposed activated sludge pla municipal community. (See also W7 (Pinto-FIRL)
W76-05324

VASTE WATER TREATMENT AT ZANUSSI.
Electroplating and Metal Finishing, Vol. 27, No. 1, p 35, 37, November, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Heavy metals, Chemical precipitation, Sludge treatment, Europe, Hydrogen ion concentration, Salts, Treatment facilities.
Identifiers: pH control, Redox control, Metal finishing wastes, Chromium, *Italy.

The Zanussi Company, Pordenone, Italy, produces more than a million refrigerators, washing machines, cookers and other white goods each month with the accompaning problem of large volumes of waste water from the many different departments responsible for cleaning, preparing, and electroplating the tons of sheet metal used. The company is installing a waste water treatment plant capable of treating almost 400 cu m of water per hour. The treatment consists of four tanks: tank 1 performs pH and redox control through the addition of sulfuric acid and sodium bisulfate; tank 2 is the homogenization and stabilization tank; tank 3 displays measures and indications of pH value, performs fine adjustment of oxide reduction value, and is the optimization of the reduction phase; and, tank 4 is the homogenizing-capacity tank for emergency interventions. Sediment obtained after treatment will be filter pressed or centrifugally separated, dried, and then used for making ceramics, roof tiles, and other building materials. The purified water will be released to the sewer. The various stages of treatment are continuously monitored and reagents are added automatically. The system is capable of reducing the amount of hexavalent chromium compounds to less than 0.1 ppm. Other heavy metal salts are also removed. (Orr-FIRL)
W76-05327

IE TREATMENT OF HIGH PROPORTIONS F TEXTILE EFFLUENT IN ADMIXTURE ITH SEWAGE,
P. Jones.
ater Pollution Control, Vol. 73, No. 5, p 551-563, ovember, 1974. 3 fig, 9 tab.

scriptors: *Waste water treatment, *Industrial stes, Municipal wastes, Textiles, Biological atment, Filters, Tertiary treatment, Sprinkler irtion, Sludge treatment, Treatment facilities, lp wastes.
ntifiers: Biofilters, Combined municipal-industl wastes.

e Borough of Glossop, U.K., treatment plant is the process of being modified and enlarged to ommodate an increased domestic population to provide for the treatment of the wastes m a textile finishing factory. The original plant designed for a flow of 5230 cu m per day; the ensions will allow for a total of 15,200 cu m per Biological filters have been chosen as a main tment system rather than activated sludge cesses. Tertiary treatment is provided by Far- spray irrigation equipment; twelve spray guns a rate of application of 7300 cu m/ha day are d. New sludge treatment is provided for by the allation of two Johnson Progress automatic r presses in conjunction with an in-line condiing system. The previously used method of digestion followed by drying of the sludge is g discontinued. Further explained are the racteristics of the sewage and textile wastes; sources of the textile wastes; the design meters for the extension, including biological rs, secondary sludge production, and recovery costs (the formulae employed are given); reatment of industrial wastes; and, the effects ic industrial wastes on the sewage works. (Orr-l.)
-05328

CATALYTIC REMOVAL OF SODIUM SULFIDE FROM AQUEOUS SOLUTIONS,
Ueno Environmental Science Research Lab., Nagoya (Japan).
Y. Ueno.
Journal Water Pollution Control Federation, Vol. 46, No. 12, p 2778-2784, December 1974. 7 fig, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, Odor, Activated carbon, Sulfides, Sodium compounds, Pulp wastes.
Identifiers: Carbon black, Ferric sulfate, *Catalytic oxidation, *Sodium sulfide.

Wet scrubbing of foul gases, such as those released during the kraft pulping process by an aqueous sodium hydrate solution is a very effective method for capturing them. Complete oxidation of sodium sulfide can remove this odor source from kraft mills, ironworks, and cellophane, town gas, and petrochemical factories. This paper reports on the oxidation of sodium sulfide in an aqueous solution through the use of recoverable catalysts. The catalytic activity of activated carbon, carbon black, and a mixture of carbon black and ferric sulfate was determined. Two processes are involved in determining the overall rate of sulfide oxidation: the rate at which oxygen is absorbed by the solution; and, the rate at which oxygen reacts chemically. The optimum process occurs in the intermediate region where the overall oxidation rate is influenced by both the oxygen mass transfer rate and the chemical reaction rate. The carbon black and ferric sulfate mixture was found to be the most effective in catalysing the oxidation of sodium sulfide. Good results were obtained with the reuse of these catalysts whether recovered chemically or by centrifugation. (Orr-FIRL)
W76-05329

IMPROVING MERCURY (II) REMOVAL BY ACTIVATED CARBON,
Texas Univ. at Austin. Environmental Health Engineering Group.
M. J. Humenick, Jr., and J. L. Schnoor.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 100, No. EE6, * 1249-1262, December, 1974. 10 fig, 1 tab, 22 ref, 1 append.

Descriptors: *Waste water treatment, *Industrial wastes, *Mercury, Water pollution sources, Chemical wastes, *Activated carbon, Chelation, Chemical precipitation, Hydrogen ion concentration.

The principal sources of mercury pollution are mercury cell chloralkali manufacturers, chemical processors, and the agricultural and pulp and paper industries. The research project described concentrated on the investigation and evaluation of a new process concept that could augment the efficiency of activated carbon treatment of waste water. The following conclusions were drawn from the results of the study: Calgon Filtrasorb 300 activated carbon removed mercury from dilute mercuric chloride solutions at pH 10 and pH 4; carbon capacities increased seven-fold in isotherm tests and almost 14-fold in column tests at the lower pH; the water-soluble chelates APDC and TETA significantly increased the removal of mercury by activated carbon at pH 10; carbon disulfide greatly increased the removal of mercury by activated carbon at pH 10 when the carbon was soaked with CS2 and dried prior to adsorption; ammonium 1-pyrrolidine dithiocarbamate (APDC) precipitated mercuric ions at pH 10 and pH 4; mercury removal in both the isotherm tests and the column run was probably increased by filtration of the APDC-mercury precipitate; low effluent concentrations were achieved in column runs with APDC chelate at high pH; good mercury removal was attained in column tests with granular activated carbon at low pH; and, column mercury capacities increased from 0.30 mg Hg to 4.1 mg Hg removed per g carbon by adjusting the pH from 10 to 4. The removal of mercury (II) by activated carbon treatment was shown to be feasible. Carbon removals from alkaline waste may be enhanced by chelation of the mercury with APDC, treatment of the carbon with CS2, or by lowering the pH of the waste water. (Orr-FIRL)
W76-05330

AGRONIMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES (REPERCUSSIONS AGRONOMIQUES DES EPANDAGES D'EFFLUENTS DES INDUSTRIES AGRICOLES ET ALTIMENTAIRES,
Institut National de la Recherche A Agronomique, Versailles (France). Station Centrale d'Agronomie.
A. Morisot, and R. Gras.
Annales Agronmiques, Vol. 25, No. 2-3, p 234-266, 1974. 6 fig, 14 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Waste water disposal, Environmental effects, Agronomy, Agriculture, Fertilization, Soil physical properties, Soil chemical properties.
Identifiers: Land application, *France.

The agronomic effects of the land disposal of wastes from the agricultural and food industries are discussed. The results of a survey, conducted in 1972, on 32 factories of the agricultural industry in France are presented. Particular attention was given to recording the evolution of the physical and chemical properties of the soils. This allowed cases of over-fertilization to be observed. Emphasis was also placed on the importance of interactions between the nature of the waste, the amount of waste applied, and the nature of the soil receiving it, in the evolution of the physical properties of the soil. The effects of these applications on the farms which receive them are also described. (Orr-FIRL)
W76-05331

POULTRY PROCESSOR USING VIBRATING SCREEN SEPARATORS TO CLEAN WASTE FLOW.
Food in Canada, Vol. 34, No. 12, p 31-32, December, 1974. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Solids removal, *Separation techniques, Canada, Waste treatment, Poultry.
Identifiers: *Poultry processing wastes.

Sherwood Farms, a Division of Robin Hood Multifoods, limited, has installed a highly efficient waste treatment system at their poultry processing plant in Dundas, Ontario. The plant generates about 100,000 gallons of waste water from the daily slaughtering of 18,000 broiler chickens. Greater than 200 gallons of wet solids, including fat, fine offal, and pin feathers, must be removed before the waste water can be treated. The solids removal problem was solved by installing a 60 inch diameter Kason Model K-60 Vibro-screen Separator. The unit is the final stage between a course 1/4 inch screen and the aerobic treatment tank of the effluent treatment plant. Blinding of the screen with fat and pin feathers is prevented by a Kason Kleen-Sweep flexible top side wiper instal led on the Kason Separator. The Kason Separator's motion is variable with simple adjustment to provide optimum screening performance for various effluent characteristics. (Orr-FIRL)
W76-05332

TREATMENT OF SUGAR REFINERY-GENERATED EFFLUENT BY THE PUMPING METHOD (DIE REINIGUNG VON ZUCHER-

FABRIKSABWASSER MIT HILFE DES UMPUMPVERFAHRENS),
Zuckerindustrie, Vol. 24, No. 10, p 536-541, October, 1974. 4 fig, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Pumps, Biochemical oxygen demand, Aeration, Dissolved oxygen, *Pumping.
Identifiers: *Sugar refinery wastes.

A simple, inexpensive method for the purification of waste waters generated in a sugar factory is presented. The waste water is purified subsequently in four ponds, having a surface area of 200,000 sq m with a mean depth of 2 meters. To achieve thorough purification and to avoid malodorous emissions due to anaerobic decay under oxygen deficient conditions, the waste water is pumped back from the fourth into the first pond by means of two worm pumps via a circulation gutter which provides for the oxygenation of the water. The worm pumps each have a discharge capacity of 500 liters/second. In this manner, it is possible to feed a sufficient amount of oxygen to the waste water and to facilitate the natural ventilation in the ponds. As a result, the BOD5 content has been reduced from an average of 1,800 g/liter to less than 25 mg/liter. (Takacs-FIRL)
W76-05333

KRAFT MILL EFFLUENT TREATMENT PROCESS,
F. A. Brothers.
Canadian Patent 957,087. Issued October 29, 1974. The Patent Office Record, Vol. 102, No. 44, p 75, October, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Patents, Color, Biochemical oxygen demand, Chemical precipitation, Sea water, *Pulp wastes.

A continuous process has been patented for treating highly colored, high BOD kraft mill effluents to reduce the BOD and color. The raw effluent is mixed with sea water in a ratio between 5 and 20 to one, respectively. This mixture is decarbonated and then adjusted to pH 7 with lme. Lime is then added slightly in excess of the stoichiometric amount to precipitate the magnesium ion content of the sea water and to form a magnesium hydroxide precipitate which removes essentially all of the colored bodies in the effluent. The precipitate is dewatered and the liquid is discharged. The precipitate is subsequently calcined to remove organic color bodies and to produce an ash containing about 60% MgO and 40% CaO. The CaO is removed in a second sea water treatment to produce saleable 98% MgO. (Orr-FIRL)
W76-05334

THE PRESENT AND FUTURE OF ALKALINE PULPING,
MacMillan Bloedel Research Ltd., Vancouver (British Columbia).
H. E. Worster.
Pulp and Paper of Canada, Vol. 75, No. 10, p 45-50, October, 1974. 2 fig, 6 tab, 29 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Biochemical oxygen demand, Color, Toxicity, *Pulp wastes.
Identifiers: *Alkaline kraft bleaching.

The present status of alkaline pulping and speculations on the future of this process are presented. The kraft mill of today has much greater capacity than that of earlier mills, is operated continuously, yields a higher quality product than other pulping methods, generates much of its own steam, recovers its chemicals with a high efficiency, and also yields valuable by-products such as turpentine and tall oil. However, significant disadvantages of kraft pulping include the high raw material requirements per ton of products, pollution of the atmosphere with reduced volatile sulfur compounds, the need to process its aqueous effluents for the reduction of such undesirable properties as BOD, color, and toxicity to fish, the very high investment cost per ton of products, and the difficulty in bleaching. The immediate future of the pulping industry should see increased use of modified kraft pulping processes such as polysulfide and H2S-kraft and non-sulfur processes such as soda-oxygen pulping; oxygen bleaching will be widely applied and integrated with the alkaline pulping liquor system to minimize water pollution; and, by-product recovery will become more widespread due to increasing demand for these products. The characteristics of an ideal chemical pulping process are discussed. (Orr-FIRL)
W76-05335

WASTEWATER RECYCLE FOR DYE HOUSES,
Illinois Water Treatment Co., Rockford.
D. J. Burke, and C. M. Burke.
American Dyestuff Reporter, Vol. 63, No. 10, p 60, 63, 65, October, 1974. 2 fig, 1 tab, 11 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Dyes, Textiles, Filtration, Ion exchange, Activated carbon, *Recycling, Water reuse, Color, Operating costs, Capital costs.

The very high BOD and COD dye plant effluent and the high degree of color necessitate some type of treatment for dye containing waste water. The particular type of waste treatment required for dye removal is a function of the class of dye and its chemical composition. The uses of filtration, activated carbon adsorption and ion exchange for treatment of dye plant effluents and water recycling are discussed. The particular system examined was designed for complete recycle of dye house effluent. The effluent is first collected in a baffled retention vessel to equalize the flow rate and contaminant loading. The equalized effluent is then screened and pumped to a diatomaceous earth filter where suspended solids larger than one micron are removed. The effluent passes from the filter to continuous counterflow carbon adsorption units. Following carbon adsorption, the dye waste stream enters a two-bed ion exchange system. Color bodies are removed in the carbon units and salts are removed in the ion exchange units. This process is capable of recycling about 80% of the water used in typical dye house operations. The operating and capital co sts are such that this system pays for itself over a five to ten year period when compared with conventional treatment processes. Pilot plant evaluations are necessary to determine the efficiency and economics of the system for a particular dye house waste water. (Orr-FIRL)
W76-05336

ROTATING DISK LOOKS PROMISING FOR PLANT WASTES,
B. C. Research Ltd., Vancouver.
J. C. Mueller, and K. S. Bindra.
The Oil and Gas Journal, Vol. 73, No. 2, p 66-68, January, 1975. 4 fig, 2 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Biological treatment, *Oil wastes.
Identifiers: *Rotating biological disk, Refinery wastes.

Petrochemical refiners are now investigating the ability of a rotating biological surface (RBS), also known as a rotating biological contractor, a rotating biological unit, or a rotating biodisk, to treat refinery effluents. The rotating surface has been shown to offer many advantages for the treatment of domestic and agricultural wastes including: short retention time; low power requirement; almost complete elimination of short-circuiting of the wastes; good sludge characteristics; excellent control of effluent quality; resistance to shock loads and upsets; no foaming problem; and, a minimal amount of required operator skill. A laboratory study is described which was conducted to assess the performance of an RBS system on petroleum refinery wastes. The RBS treatment was found to detoxify the refinery waste exceptionally well. The RBS system, on a laboratory scale, was capable of meeting British Columbia Provincial effluent standards for a local oil refinery effluent. The study concluded that the advantages offered by this system for the treatment of domestic and agricultural wastes are also true for the treatment of refinery wastes. (Orr-FIRL)
W76-05337

OZONIZATION AS A MEANS OF WASTE WATER PURIFICATION,
J. Trejtnar.
Czechoslavak Heavy Industry, Vol. 10, p 34-35, 1974. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Ozone, Water reuse, Oxidation, Laboratory tests, Pilot plants.
Identifiers: Cyanide, *Metal finishing wastes.

Metal surface finishing waste waters are discharged with quantities of toxic materials, including cyanide. One method to eliminate cyanide is ozonization. Research was done at the Water Conservancy Research Institute and at the Chemical Equipment Research Institute, both in Brno, Czechoslovakia. The technology tested under both laboratory and pilot plant conditions consisted of ozonization of waste water and the use of ozone for the oxidation of the substance to be neutralized as well as for other materials, including bivalent iron, manganous salts, hydrogen sulfide, and nitrates. The reaction of ozone with cyanide works in two steps: 2KCN + 203 = 2KCNO + 202. Then, 2KCNO + H20 + 303 = 2KHC03 + N2 + 302. For ozone oxidation into cyanates about 1 to 1.6 volumes of ozone for one volume of cyanides are required. The process of ozonization can be performed continuously, with the purified water recirculated as service water. (Kramer-FIRL)
W76-05339

SLUDGE DEHYDRATION DURING THE PURIFICATION OF CIRCULATING WATER IN FOUNDRIES AND OF RESIDUAL WASTE WATER IN FOUNDRIES (SCHLAMMENTWAESSERUNG BEI DER REINIGUNG VON GIESSEREIKREISLAUFWASSER UND GIESSEREI-RESTABWASSER),
B. Moergeli, and G. Lerch.
Giesserei-Praxis, No. 20, p 410-413, October, 1974. 6 fig, 5 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Sludge treatment, *Dewatering, Centrifugation, Dehydration.
Identifiers: *Foundry sludge, Filter press, *Sludge dehydration.

The efficiencies of five different methods in dewatering of sand-containing sludges from foundry were studied in comparative tests. The dry matter content of the sludge averaged 8 percent. A decanter centrifuge (Escher-Vyss system) required the lowest investment cost and was highly efficient, but it was subject to abrasion and delivered a sticky filter cake which caused problems during transportation and disposal. A more expensive chamber filter press proved to be highly reliable and efficient in the case of fine filter cakes. A double screen belt press (Andritz system) proved to be highly dependable in operation due to its simple design and also proved efficient, yielding a filter cake with dry matter contents ranging from 49 to 64 percent. The tested filter press (Prefiltec system) was not suitable for the dehydration of foundry sludge. Another variable-chamber filter press supplied a filter cake with low water content but had a poor specific output and required preliminary concentration of the sludge. (Takacs-FIRL)

/76-05340

EMOVAL OF HEAVY METAL IMPURITIES ROM AQ EFFLUENTS.
etherlands Patent NL 7404-782. Issued October , 1974. Derwent Netherlands Patents Report, ol. No. 43, p D2, December 3, 1974.

escriptors: *Waste water treatment, *Industrial astes, *Patents, *Heavy metals, Tannery wastes, agnetic studies, Iron.
entifiers: Metal plating wastes, Magnetic separa-n, Ferromagnetic iron oxide.

method for the removal of heavy metal impuri-s from aqueous solutions, such as effluent water m metal plating plants, glass industry, soda oduction and tanneries, has been patented. The ste water is treated with an alkali in an amount to 1.2 times the equivalent of the anions of the avy metal compounds. An oxidizing gas, eferably oxygen or air, is introduced at 60 C. e precipitated hydroxide is then converted into ferromagnetic Fe304 and/or Fe0(OH), which then magnetically removed from the water gether with other metals occupying the places of iron atoms in the ferromagnetic compounds. S04 in water can be added to ensure that iron is sent in an excess of greater than twice the uivalent of other metals. Alternatively, finely mminuted metallic iron can be added and metal re noble than Fe would then be deposited on iron particles and removed together by a mag-ic field. (Orr-FIRL)
6-05341

GIENIC ASSESSMENT OF CERTAIN SUR-CE-ACTIVE SUBSTANCES-THE COM-NENTS OF EFFLUENTS FROM TEXTILE DUSTRY ENTERPRISES
GIYENICHESKAYA OTSENKA NEKOTO-KH POVERKHNOST-NOAKTIVNYKH SHCHESTV-KOMPNENTOV STOCHNYKH D PREDPRIYATIY TEKSTIL'NOY PRO-'SHLENNOSTI),
primary bibliographic entry see Field 5A.
6-05342

ONE-CARBON DYE-WASTE TREATMENT.
tile Industries, Vol. 138, No. 10, p 43, 45, Oc-er, 1974. 1 fig, 2 tab.

criptors: *Waste water treatment, *Industrial tes, *Dyes, *Ozone, Textiles, Activated car-, Oxidation.
ntifiers: Synergistic effects.

ently, waste dyeing water has been recognized a source of environmental pollution and arch has commenced on several new treat-t techniques. One new technique is based on a bination of ozone and granular activated car-The use of oxidation by ozone and adsorption ranular activated carbon to treat waste water ell-documented. What is less well-known is the rgistic effect of these methods when com-d. The combined use of ozone and activated on, as compared with the separate use of , will often produce a doubled effect and lt in low investment costs. The e/activated carbon process is free of disad-ages of sludge production that occur when entional processes such as coagulative ipitation or activated sludge are used. The ess basically involves decomposing and loring dyes in the waste water by ozone, while mposing dissolved organic substances and removing dirt by granular activated carbon. carbon is periodically removed after use and erated at high temperature. The process has ollowing advantages: effective decoloration emoval of organic substances in addition to ased treatment power of the activated car-extremely high decoloration power of ozone; aming of treated water because of surface-active agents being decomposed; removal of noxious substances such as phenol; no sludge production; no particular location requirement for the installation; only a small area needed for the installation because of its compact size; simplicity in automatic operation and ease of maintenance; high performance and stability of the ozone generators; high adsorption power and regeneration efficiency; a synergistic effect from their combination; low operating costs; and, no secondary pollution. (Orr-FIRL)
W76-05343

A SWEDISH PROBLEM SOLVED,
W. Campbell.
Effluent and Water Treatment Journal, Vol. 14, No. 10, p 586-591, October, 1974. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Foreign research, Municipal wastes, Tannery wastes, Pre-treatment(Water), *Biological treatment, Activated sludge, Europe, Water quality standards, Filtration.
Identifiers: Flocor, Flow equalization, Slaughterhouse wastes, Biofilters, *Sweden.

The new Kavlinge effluent treatment plant in southern Sweden illustrates the success that Sweden has had in combining industrial and municipal waste waters to meet her stringent standards of effluent quality. The treatment facility is designed to receive a volume of 6250 cu m/day and pollution load of 4700 kg BOD5/day. In addition to the municipal wastes, slaughterhouse/meat packing and tannery effluents are also treated. Preliminary treatment, including fat and grease separation and screening, is performed at the industrial sites but flow equalization occurs at the treatment facility. After pilot plant studies and examination of existing similar treatment plants, a two-stage biological system was recommended for both its economy and technical effectiveness. After flow balancing, the waste is treated over a single-stage biofilter systemcontaining 1230 cu m of Flocor. The effluent from the first stage then passes to an activated sludge system which operates on conventional loads and utilizes diffused air. During the first year of operatiOn (1973) an overall removal of 90% of the BOD was achieved. (Orr-FIRL)
W76-05344

INDUSTRIAL EFFLUENT PURIFICN.
German Patent DS 2360-491. Issued October 3, 1974. Derwent German Patents Abstracts, Vol. V., No. 41, p D2, November, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Dyes, Chemical wastes, Heat treatment, Evaporation, Cyclones, Separation techniques.

A new method for purifying an industrial effluent, such as wash water from a dye works, has been patented. The effluent is heated to a temperature close to its boiling point at such a pressure that when evaporated in a tube evaporator to produce a volume increase of 1000:1, it will form steam that can be utilized in another part of the process. The resultant mixture of steam and foam from the evaporator is passed at high velocity into a separator, such as a cyclone. The energy of a purified steam is used in the process. The condensed steam is recycled as process water and the concentrate is burned. Where volatile impurities are present, the steam is passed through an adsorption and/or neutralization filter. (Orr-FIRL)
W76-05345

THE BIOLOGICAL TREATMENT OF FOOD INDUSTRY EFFLUENTS,
University Coll., Cardiff (Wales). Dept. of Microbiology.
C. F. Forster.
Institute of Food Science and Technology (U.K.), Vol. 7, No. 4, p 227-236, December, 1974. 4 fig, 2 tab, 30 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Dairy industry, Poultry, *Biological treatment, Pre-treatment(Water).

A summary of the effluents produced by the food industry is presented which demonstrates the viability of treating these effluents by the normal bio-oxidation processes used in waste water treatment. Certain rules must be followed to ensure that optimum treatment occurs: adequate pretreatment must be performed; the flow must be balanced; the pH and nutrient levels must be adjusted; and, the system must not be overloaded. If these rules are followed then the only remaining problem is where to perform the treatment. Economics will determine whether the entire effluent will be discharged to the sewers, whether a partially treated effluent will be discharged to the sewers, or whether complete treatment will be done at the factory and the final effluent either reused or discharged to a natural watercourse. Case histories are presented which illustrate treatment methods for effluents from a dairy, a potato processing factory, and a distillery. (Orr-FIRL)
W76-05346

SALINE WATER CONVERSION ENGINEERING DATA BOOK - 1975.
Kellogg (M. W.) Co., Piscataway, N. J.
For primary bibliographic entry see Field 3A.
W76-05347

HOUSEHOLD WATER USE,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05353

THE SEWERLESS SOCIETY,
H. H. Leich.
Bulletin of the Atomic Scientists, p. 38-44, November 1975. 22 ref.

Descriptors: *Human population, *Waste treatment, *Domestic wastes, Waste disposal, Sewage disposal, Equipment, Recycling, *Waste water treatment.
Identifiers: Human wastes, *Flush toilets, *Sewerless toilets.

Flush toilets waste about 40% of household water and contaminate water supplies. Present waste treatment systems risk transmitting diseases to water users downstream, waste large quantities of drinking water, require expenditures for sewer lines and treatment plants, accelerate eutrophication of water bodies, leak raw sewage, and build-up sewage sludge. It is suggested that sewage disposal systems be decentralized with wastes disposed of in individual dwellings. At least seven different types of sewerless toilets or sewage disposal systems are available or under development. Incinerating toilets are convenient but use large amounts of energy and sometimes create odors. Composting toilets do not require energy or water and produce compost free of pathogenic bacteria. Biological toilets turn wastes into water by enzymes and bacteria but require periodic additions of enzymes and bacteria and changes of charcoal filters. Oil flushed toilets separate wastes by gravity, incinerate wastes, and recycle the oil. Cannisters could hold wastes until transported to plants which could produce methane and fertilizer. Vacuum systems to remove wastes and aerobic tanks to digest wastes are also described. Non-polluting methods for human body waste disposal and generally applicable technology should be intensively investigated. (Buchanan-Davidson--Wisconsin)
W76-05439

LIQUID WASTE DISPOSAL SYSTEM,
Trane Thermal Co. Conshohocken, Pa.
Y-H. Kiang.
Chemical Engineering Progress, Vol. 72, No. 1, p 71-77, January, 1976.

Descriptors: *Waste water treatment, *Waste water disposal, *Industrial wastes, Liquid wastes, Incineration, Burning.

A liquid waste disposal system has been developed that will efficiently and economically dispose of organic, halogenated, metallic, and aqueous industrial wastes. The integrated system utilizes the heat and material available in each type of waste to lower the operational cost for disposal of other wastes. A typical integrated system comprises pre-concentrator, burner, incinerator, quench chamber, heat exchanger, and gas treatment unit. The organic and halogenated wastes are used in the burner as auxiliary fuel. Metallic wastes are introduced downstream of the burner through the incinerator. The aqueous wastes are pre-concentrated and then injected into the combustion flame. Incinerator product gas is used as the pre-concentration medium or else is cooled in the quench chamber. The effluent from the quench chamber is concentrated through the heat exchanger. The cooled gas from the heat exchanger is discharged to the atmosphere after final processing in the gas treatment unit. This basic integrated treatment system has been proven successful in a number of full-scale applications. Typical industrial wastes are converted into materials and energy which can be used inhoUse or commercialized for profit while the gases discharged meet air pollution regulations. (Orr-FIRL)
W76-05481

REUTILIZATION EXPERIMENTS ON WASTE WATER FROM PAPER AND PULP MILLS (KAMI PARUPU KOJO HISUI NO SAISEI RYO JIKKEN),
T. Ogasawara.
Kagaku Kojo, (Chemical Factory), Vol 19, No 10, p 60-61, 1975. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, Lignins, *Pilot plants, Activated sludge, Chemical precipitation, Activated carbon, *Water reuse, Recycling.

The operational results of a pilot plant for treatment of pulp and paper mill effluents are described. The flow of the treatment processes is pH adjustment, activated sludge, coagulation precipitation with calcium oxide, carbonation, sand filtration, and then activated carbon adsorption. The activated carbon treated water will be treated by electrodialysis or reverse osmosis in the future. The experimental results of the treatment processes following the coagulation precipitation stage are presented. After the pH of the influent to the carbonation process is adjusted, the water is aerated with a flue gas containing carbon dioxide to produce calcium carbonate. The calcium carbonate slurry is then recirculated within the carbonation bath to increase the calcium carbonate particle size which promotes better precipitation. Sand filtration with 0.6 mm diameter sand removes the SS which are not removed in the carbonation stage. The effluent from sand filtration contains less than 5 ppm SS. This effluent is passed into activated carbon adsorption towers after neutralization of the effluent. The COD values in the water before and after carbon treatment are 80-120 ppm and 30-50 ppm, respectively. The adsorption of COD by the activated carbon is lower than that generally observed in industrial or municipal waste water treatment, possibly due to the presence of high molecular weight compounds such as lignin in pulp waste water.(Katayama-FIRL)
W76-05482

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (FIRST PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
H. R. Amberg, I. Gellmand, and R. H. Scott.
Tappi, Vol 58, No 11, p 59-67, November, 1975. 5 fig, 4 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Foreign research, Pollution abatement, Treatment facilities, *Pulp wastes, Water quality standards.
Identifiers: *USSR(Eastern area).

Due to a cooperative working agreement between the United States and the Soviet Union, a technical delegation of four pulp and paper experts visited a number of Soviet pulp and paper mills as well as governmental agencies responsible for pulp and paper manufacture and related environmental problems in the U.S.S.R. The objectives of the visit were to determine the status of water pollution control in the Soviet Union and to see if any areas exist in which there would be benefits from cooperative programs between the two countries. This is the first half of a report on the visit which includes descriptions of the seven pulp and paper waste water treatment plants visited and also information and observations obtained from meetings with paper industry ministry personnel who control pulp and paper mill production and design and an agency which provides for the development and maintenance of water quality standards. This part covers the eastern part of the Soviet Union. (See also W76-05484) (Orr-FIRL)
W76-05483

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (SECOND PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services.
H. R. Amberg, I. Gellmand, and R. H. Scott.
Tappi, Vol. 58, No. 12, p 71-75, December, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Foreign research, Pollution abatement, Treatment facilities, *Pulp wastes, Water quality standards.
Identifiers: USSR(Western area).

Due to a cooperative working agreement between the United States and the Soviet Union, a technical delegation of four pulp and paper experts visited a number of Soviet pulp and paper mills as well as governmental agencies responsible for pulp and paper manufacture and related environmental problems in the U.S.S.R. The objectives of the visit were to determine the status of water pollution control in the Soviet Union and to see if any areas exist in which there would be benefits from cooperative programs between the two countries. This is the second half of a report on the visit which includes descriptions of the seven pulp and paper waste water treatment plants visited and also information and observations obtained from meetings with paper industry ministry personnel who control pulp and paper mill production and design and an agency which provides for the development and maintenance of water quality standards. This part covers the western part of the Soviet Union, and reports the conclusions of the delegation. (See also W76-05483) (Orr-FIRL)
W76-05484

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA, (2) ON THE DEGRADATION OF LIGNIN SULFONATES,
Nagoya Univ. (Japan). Faculty of Agriculture.
H. Kawakami, N. Mori, and T. Kanda.
Japanese TAPPI, Vol. 29, No. 11, p 36-41, November, 1975. 3 fig, 8 tab, 17 ref.

Descriptors: *Waste water treatment, *Industria wastes, Pulp and paper industry, *Pulp wastes Foreign research, Lignin, *Biodegradation, Bac teria, *Biological treatment.
Identifiers: *Lignin sulfonates.

A study was conducted on the biodegradation o the components of pulp waste by bacteri Degradation of pine and beech lignin sulfonates b Pseudomonas ovalis was studied in stationary cu tures for periods up to 60 days. Lignin sulfonate were slightly decomposed by this bacterium a compared with kraft lignin. The biodegraded ligni sulfonates included small amounts of nitroge derived from protein and nucleic acid of the ba terial cells. Vanillin and syringaldehyde producin groups were decreased in the biodegraded ligni samples. p-Hydroxy benzonate and 4-methox isophthalic acid producing groups increased as th biodegradation of pine lignin sulfonate progresse The results indicate that demethoxylation was o curring during the relatively long incubatio period. Biodegradation of lignin sulfonat progresses in a manner similar to the degradatio of kraft lignin. (Orr-FIRL)
W76-05485

OXIDATION UNIT CUTS DOWN ODOR FRO KRAFT PULP MILLS,
Groupement de la Cellulose, Saint-Gaude (France).
A. Canonne.
Pulp and Paper International, Vol. 17, No. 13, 50-51, 58, December, 1975. 3 fig, 1 tab.

Descriptors: *Waste water treatment, Pulp a paper industry, *Pulp wastes, *Odor, *Air pol tion, Sulfite liquors, *Oxidation, Industrial wast
Identifiers: *Cellox process.

The new Cellox process for treatment of bla liquors may be an answer to odor problems and pollution problems in kraft pulp industry pla with direct-contact evaporators. The Cel process permits almost total air oxidation of sulfides immediately prior to their treatment in direct-contact evaporator. By reducing the H content of combustion gases down to a few pp Cellox abates pollution. In the Cellox process, is diffused through the concentrated liquor means of porous, sintered steel candles in the idation reactor. The candles are connected with air compressor through pipes. Air bubb travelling through the liquor oxidize the sulfi and the gas is discharged into the atmosph Since the reactor operates on the countercurr principle, flue gas emissions are completely od less and contain no black liquor droplets. The idized, deaerated liquor is then pumped to direct contact evaporator. The Cellox process be used for oxidation treatment of concentr black liquor as either a complete one-stage un a two-stage unit. It can also be employed as a c plementary finishing step where mills are alre equipped for oxidation treatment. (Loustau-FI
W76-05486

SYSTEM ANALYSIS OF REFINER M OPERATION,
Idaho Univ., Moscow. Dept. of Chemical gineering.
V. Venkatesh, S. R. Corson, and L. L. Edward
Tappi, Vol. 58, No 12, p 86-89, December, 19 fig, 1 tab, 5 ref.

To provide accurate data on fresh water req ments, white water consumption, and effl flows, a computer system enabling mill oper to check existing mill operating conditions a project future changes has been developed. computer program consists of an executive gram and a set of generalized subrou representing each of the basic processing step pulp and paper mill. It performs the balance c lations for all streams in the circuit in the sequ specified by the user. At the end of each itera

tests to see whether the steady-state has been hieved. When convergence occurs, the results e printed. The system was used as an aid in aluating various process alternatives in a undwood newprint mill for reducing sewer ds. With the data provided, the computer ex- ined four alternatives to the process and oduced information on each alternative. Details the mill process and the alternatives generated the computer program are provided. The com- er program was shown to develop reliable data system alternatives and to aid in evaluating ir effects on paper quality. (Loustau-FIRL)
6-05487

EATMENT AND SAFE DISPOSAL OF CA- ONIC COATING COLORS,
rck and Co., Inc., Pittsburgh, Pa.
H. Windhager.
p and Paper Canada, Vol. 76, No. 12, p 45-47, ember, 1975. 4 fig, 4 tab, 5 ref.

criptors: *Waste water treatment, Pulp and er industry, *Color, Cations, *Neutralization, mers, Clays, *Pulp wastes, Industrial wastes. tifiers: *Cationic coating colors, Kaolin.

ardous cationic coating colors in paper mill ef- nts can be treated by simple processes in an ef- nt treatment system, resulting in neutralization deactivation. A number of neutralization niques were evaluated for effectiveness and omy. Synthetic anionic polymers were evalu- by the zeta potential technique. Polyacrylic s and lignosulfonates were found to be effec- flocculants for suspended cationic solids. um hexametaphosphate (Calgon) was also ef- ve. Several commercial kaolin clays were ated; a clay with phosphate concentrations a significant neutralizing effect on cationic mers. Calcium carbonate was also tested, but ot have a sufficient effect. Kraft black liquor ested by a colorimetric test, and was found to ffective, however, compositions of liquors from mill to mill. It was estimated that of the alization techniquis tested, lignosulfonate d be the least expensive. All of the methods latively simple and would require minimum fication of existing treatment facilities. In ad- , coated broke can be used without elaborate ssing.(Loustau-FIRL)
05488

TION METHOD FOR THE PURIFICA- OF PETROLEUM CONTAINING WASTE ERS (SORBTSIONNYE NETODY OCHIST- EFTESODERZHASHCHIKH STOCHNYKH
Garibov, A. A. Mamedov, and S. A.
ieva.
aydzhanskiy Khimicheskiy Zhurnal, No. 3, 6, 1975.

iptors: *Waste water treatment, Industrial s, *Phenols, *Adsorption, *Activated car- *Oils wastes, *Sorption, *Separation ques, Water purification, Organic com- s.

fficiency and suitability of different solid ts for the adsorption of petroleum in waste generated in extraction processes was stu- Activated carbon type AG-5 was found to he highest sorption capacity of all other f activated carbon. Its capacity was about s high for petroleum in waste water than for um products. Aluminum and iron hydrox- howed negligible sorption capacity for um. (Takacs-FIRL)
5489

ES OF A PURIFICATION MODEL FOR OLIC WASTES BY ELECTROCHEMICAL OD (BADANIA MODELOWE OCZYSZC- ZENIA SCIEKOW FENOLOWYCH METODA ELEKTROCHEMICZNA),
A. Dabrowski, J. Mieluch, A. Sadkowski, J. Wild, and P. Zoltowski.
Przemysl Chemiczny, Vol. 54, No 11, p 653-655, November, 1975. 2 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Phenols, *Model studies, *Electrolysis, Electrodes, Flow rates, Electricity, Laboratory tests, Electrochemistry, Water purification, *Electrolytes.

A laboratory model for the purification of phenolic wastes with respect to quantity, flow output and power input under certain technical conditions is presented. Its chief component was an electrode-supplied electrolyzer with a two-chamber tank. The temperature of the electrolyte was maintained between 20 and 130 C by an oil thermostat. Phenol content in the waste water was determined by ultraviolet spectrophotometry while phenoxyacetate was measured by chromatography. The controlling parameters were temperature, flow density, tension, and flow rate. The model permitted the investigation of the effects of anodic current density, distance between electrodes, temperature, type of electrodes, flow rate, and circulation of the electrolyte on the oxidation rate of pollutants, especially phenolics, in waste water. The electrical efficiency of the process rapidly decreased to the extent that the phenol concentration decreased. If the entire phenol content with an initial concentration of 0.5 g/liter, with no other pollutants present, was oxidized, then the mea current consumption was 100 mg/A/hr and the mean voltage consumption was 30-40 mg/v/fr. The best effects were achieved for waste water with a pH of 8. The model is useful in projecting installations on an industrial scale. (Tallert-FIRL)
W76-05490

INTENSIFICATION OF THE BIOCHEMICAL PURIFICATION OF PHENOLIC WASTE WATERS IN AERATION TANKS (INTENSIFIKATSIYA BIOKHIMICHESKOY OCHISTKI FENOLSODERZHASHCHIKH STOCHNYKH VOD V AEROTENKAKH),
A. M. Asonov, S. V. Burkov, V. M. Kagasov, and A. A. Kern.
Koks i Khimiya, No. 9, p 41-43, 1975. 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Phenols, Biodegradation, Biological treatment, *Aeration, Treatment facilities.
Identifiers: *Aeration tanks.

An improved aeration tank, a biotank, developed to enhance the biological purification of phenolic waste waters in coking plants, is described. The biological purification process is intensified by increasing the activated sludge concentration in the tank without recirculation from the settling tank, which is achieved by the use of floating or anchored charge in the tank. The biomass is grown on the charge, which is preferably porous. While coke, coal, and certain plastic materials as floating charge proved to be useful, the oxidation capacity was highest when anchored charge was used. It was possible to increase the oxidation capacity and the productivity of the treatment plant by 2-3 times as compared with conventional aeration tanks. (Takacs-FIRL)
W76-05491

FINAL TREATMENT OF PETROLEUM CONTAINING WASTE WATERS IN HIGHSPEED FILTERS FOR PUMPING THEM INTO OIL-BEARING BEDS (DOOCHISTKA NEFT'SODERZHASHCHIKH STOCHNYKH VOD NA SVERKHSKOROSTNYKH FIL'TRAKH S TSEL'YU ZAKACHKI IKH V PRODUKTIVNYE PLASTY),
G. N. Nikiforov, and A. B. Adel'shin.
Neftepromyslovoe Delo, No. 9, p 31-34, 1975.

Descriptors: *Waste water treatment, *Filtration, *Oil wastes, Ultimate disposal, Separation techniques, Liquid wastes, *Filters, Organic compounds.
Identifiers: Stratal waters, *Sand filters.

Rapid sand filtration of stratal waters with high mineral and petroleum contents, generated in petroleum processing, was studied. A quartz sand layer of 2.64 m, composed of particles 2.5-5 mm in diameter, is recommended for preliminary filtration in two-stage filters for stratal waters containing up to 120 mg of suspended matter, up to 120 mg of petroleum, and up to 70 mg of total iron per liter. The filtration rate should be 50 m/hr in the preliminary stage, and 25 m/hr in the second filter. The removal efficiency was 85-90% for suspended matter, 64-85% for petroleum, and 85-100% for iron. For stratal waters with lower pollutant content, the grain size in the preliminary filter stage should be between 1.4 and 2.5 mm, and the rate of filtration in this stage should be 56 m/hr. Different coagulants, such as aluminum sulfate, iron chloride, calcium chloride, calcium hydroxide, aluminum hydroxide, and ammonium hydroxide, and ammonium hydroxide were tested; ammonium hydroxide was found to be the best coagulant. The recommended dose is 150 mg/liter on an ammonia basis. (Takacs-FIRL)
W76-05492

BIG SAVINGS WITH REVERSE OSMOSIS AND ACID COPPER,
J. Schrantz.
Industrial Finishing, Vol. 1, No. 12, p 30-32, 34, December, 1975. 6 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Reverse osmosis, Membrane processes, Recycling, Conservation, *Water reuse, Illinois, Industrial wastes.
Identifiers: *Metal finishing wastes, Zero discharge, Closed-loop systems, Acid copper.

Reverse osmosis (RO) treatment is saving materials and water at the Evanston, Illinois, plating plant of Federal Tool and Plastics Division of VCA Corporation. More than 8000 sq ft of plastic is electroplated daily at the plant. The RO treatment has reduced weekly copper consumption by one-third. In addition to returning concentrated materials to the plating bath, the closed-loop RO system reuses purified rinse waters. The RO unit is an automatic compact unit called an Osmonics Osmo-30043. It is composed of nine cellulose acetate membranes housed three each in three tubes. A stainless steel heat exchanger, fed with external cooling water at 65 F, maintains the operating temperature below 80 F. The concentrate from the RO treatment contains 40-48 ounces/gal of copper sulfate and acid salt. Dissolved solids in the concentrate total 10,000 ppm, in the second rinse, 1500 ppm, and in the permeate, 250 ppm. Several times a day the pumping pressure to the RO is valved to less than 300 psi to increase membrane flowthrough and thus lengthen the membrane life. (Loustau-FIRL)
W76-05493

DIFFERENTIAL-BED STUDY OF CYANIDE TREATMENT WITH ACTIVATED CARBON,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
R. Prober, and W. E. Kidon.
Industrial and Engineering Chemistry, Process Design and Development, Vol. 15, No. 1, p 223-225, January, 1976. 2 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Activated carbon, Adsorption, Analytical techniques, Copper.
Identifiers: *Cyanide wastes, *Metal finishing wastes.

A differential-bed study was performed to provide data on activated carbon treatment of high cyanide

loadings such as those present in waste waters from electroplating shops, steel mills, and coke plants. Test solutions of reagent CuSO4 and N/CN in water were circulated through a packed carbon column with an upflow of 35 ml/min. Samples were withdrawn at 30 minute intervals and analyzed for total cyanides by a two-step procedure which consisted of direct analysis with a Cn-probe and indirect analysis by the method of known additions with a specific Af(+)/S2(2-) probe. Rate data and composite concentration curves are presented in a table and graph. The rate data confirmed earlier published data for activated carbon treatment of cyanides in the presence of copper dissolved oxygen that sorption rates were 40-70 micromolecules/g-hr for the optimum pH range of 6.5-8.0. Cyanide/copper molar ratios less than or equal to three result in precipitation outside the activated carbon bed. Rate data for oxygen and copper do not correlate with those for cyanides. Further data are needed to characterize formation of CNO- and elucidate the role of copper and dissolved oxygen in the mechanism, to determine the effects of temperature and particle size, and to consider long-term effects. (Loustau-FIRL)
W76-05494

NEW MEMBRANES FOR TREATMENT OF METAL FINISHING EFFLUENTS BY REVERSE OSMOSIS.
Plating and Surface Finishing, Vol. 63, No. 1, p 64, January, 1976. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Reverse osmosis, Membrane processes, *Membranes, Hydrogen ion concentration.
Identifiers: Membrane life, *Metal finishing wastes.

Although reverse osmosis (RO) is a viable technique for the purification of metal finishing wastes, current membranes are reliable only within a pH range of 2.5 to 12. Cyanide bath rinse waters with a pH of 12-13 and acid copper bath rinse waters with a pH of 1-2 excessively shorten membrane life. The goal of AES Project 36 was to examine the practicality of a new membrane (NS-100) developed by the North Star Division of Midwest Research Institute. Long-term laboratory-scale RO tests were operated with acid copper and alkaline zinc cyanide baths using half-inch fiberglass RO tubes. Measurements were made of permeate flux, copper, acid, zinc, and cyanide rejections, total dissolved solids concentration, and organics rejection. The project demonstrated that the NS-100 membrane exhibits the chemical resistance and operating lifetime needed for practical application in metal finishing operations. However, the tubular NS-100 membrane has not yet been developed to a stage permitting on-site testing. (Orr-FIRL)
W76-05495

PROCESS FOR REMOVING HEAVY METALS FROM SOLUTIONS,
Stamicarbon B. V., Gellen (Netherlands). (Assignee).
J. H. Tooenheym, and B. H. N. Dassen.
United States Patent 3,931,002. Issued January 6, 1976. Official Gazette of the United States Patent Office, Vol. 942, No. 1, p 428, January 6, 1976.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Heavy metals, Separation techniques, *Solids contact processes, Mixtures, Liquid wastes.
Identifiers: *Keratin treatment, Gaseous mixtures.

A process for removing heavy metals from solutions and gaseous mixtures has been patented. The solutions or gaseous mixtures are contacted with a sulfur-containing reagent selected from the group consisting of reduced keratin, Bunte salts of keratin, and natural or synthetic polyamides at least part of whose amide groups has been replaced by thia-amide groups. The metals then become bound to the reagent. The Bunte salts of keratin are derived from keratin by treatment of the keratin in an aqueous medium with the aid of sulfite ions. The sulfite ions are derived from either alkali metal sulfites or alkaline earth metal sulfites. (Orr-FIRL)
W76-05496

LOOP CLOSED ON CADMIUM.
Products Finishing, Vol. 40, No. 6, p 50-53, March, 1976. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Evaporation, *Recycling, Heavy metals, *Cadmium, New York, Water reuse.
Identifiers: *Metal finishing wastes, Cadmium plating.

The Dzus Fastener Company, West Island, NY, barrel plates its steel products with cadmium. A chemical-destruct system, installed in the 1950's, was incapable of meeting the stringent standards of the Suffolk County Department of Environmental Control. Installation of a 25 gph 'Wastesaver' evaporative recovery system has enabled the company to develop a closed-loop cadmium plating cycle. The evaporative recovery unit receives rinse water from the first of three counter-flowed rinse stages through an intermediate reservoir. It then evaporates the rinse water and returns distilled water directly to the rinse tanks. The concentrate is returned to the plating bath. Use of this system has eliminated chemical consumption from the previously used chemical-destruct system; eliminated losses of plating chemicals in the dragout; reduced water consumption; and, substantially lowered cartage costs for sludge removal. The evaporator is presently saving the company about $8000/year by the elimination of chemicals for chemical-destruction; it should pay for itself within two to three years. (Orr-FIRL)
W76-05497

EFFICIENT, NONPOLLUTING ETHYLBENZENE PROCESS,
Mobil Research and Development Corp., Paulsboro, N. J.
F. G. Dwyer, P. J. Lewis, and F. H. Schneider.
Chemical Engineering, Vol. 83, No. 1, p 90-91, January 5, 1976. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Recycling, Water reuse, *Catalysts, Chemical reactions.
Identifiers: *Ethylbenzene process.

An efficient, nonpolluting fixed-bed ethylbenzene process utilizing a solid, non-Friedel-Crafts catalyst to alkylate benzene with ethylene has been developed. After preheating and vaporization, fresh and recycled benzene combines with an alkylaromatics recycle stream and fresh ethylene. The mixture is fed to the alkylation reactor containing a solid catalyst, APEB. The reaction occurs at greater than 700 F, at 200-400 psi, and at high ethylene space-velocities. The aromatics-ethylene ratio is 5:20. Unreacted benzene from the reactor effluent is recycled to the alkylation reactor. Conversion of ethylene is essentially complete. The benzene-free product is then separated into an ethylbenzene final product and a heavier bottoms fraction. The latter is further separated into an alkyl-aromatics stream that recycles to the alkylation section and a residue that amounts to less than two weight percent on total feed and serves as fuel. Catalyst regeneration, necessary at most once every few weeks, uses nitrogen-air mixtures of controlled oxygen content to prevent an excessive temperature rise. The process was tested successfully in a 40 million lb per year plant in 1975 and is now ready for commercial use. The process avoids pollution problems, reduces catalyst consumption, eliminates the need for highly-corrosion-resist construction materials, and recovers more ea the heat of reaction. (Loustau-FIRL)
W76-05498

SOLVENT RECOVERY FROM POLYM PRODN. WASTES.
German Patent DS 1719-457. Issued Octobe 1975. Derwent German Patents Abstracts, Vol. No. 42, p A1, November 25, 1975.

Descriptors: *Waste water treatment, *Indus wastes, *Patents, *Solvents, Polymers, Chem wastes, Recycling, *Evaporation.
Identifiers: Evaporators, Solvent recovery.

A patent has been issued for a device to be uti in recovering solvent from the wastes f production of polymers such as polyethylen polypropylene. In such cases, the boiling poi the solvent at atmospheric pressure is below melting point of the polymer. The device c prises a centrifugal thin-layer evaporator oper at or below atmospheric pressure, a compres feed pump, and a heater operating under pres The wastes are pressurized before expanding the evaporator. A rotor breaks up the solids small particles. The device has high output pe volume. (Orr-FIRL)
W76-05499

5E. Ultimate Disposal Of Waste

FEASIBILITY OF REGIONAL UTILITIES MANAGEMENT OF INDUSTRIAL AND NICIPAL WASTES,
Michigan Dept. of Commerce, Lansing. Off Economic Expansion.
For primary bibliographic entry see Field 5G.
W76-05003

A SUPPLEMENTAL SOCIO-ENVIRONME DECISION TOOL: VALUE CONFLICTS LONG ISLAND,
Weston (Roy F.) Inc., Roslyn, N.Y.
For primary bibliographic entry see Field 5D
W76-05049

UNSATURATED FLOW DURING SOIL TI MENT OF SEPTIC TANK EFFLUENT,
Soil Survey Inst., Wageningen. (Netherlands
For primary bibliographic entry see Field 5B
W76-05058

WASTE MANAGEMENT SYSTEM,
H. D. Dick.
United States Patent 3,912,598. Issued Octo 1975. Official Gazette of the United States Office, Vol. 939, No. 2, p 924, October, 197

Descriptors: *Waste treatment, *Waste di *Patents, *Burning, *Filtration, Conden Potable water, Catalysts, Equipment.

A patent has been granted for a waste mana system. Equipment consists of a waste tank, a container for pressurized fuel-g means for pressurizing the holding tank. A is located between the waste holding tank container. A reaction chamber includes a shell, the interior of which is divided int and lower chambers. Within the lower cha a burner unit; within the upper chamber is one waste discharge nozzle, which is conn the waste holding tank and discharges reaction chamber. Immediately above the are catalytic purifying means which material to be contacted by the vapor p The fuel gas is ignited at the burner unit. V tion products of the reaction are conden liquid water and further purified by filtrati duits then direct the vaporization produ potable water tank. (Kramer-FIRL)

76-05063

WAGE AS A RESOURCE,
essex Water Authority, Bristol (England).
erations Directorate.
r primary bibliographic entry see Field 5D.
76-05066

ASIBILITY OF HYDRAULIC TRANSPORT GROUND HOUSEHOLD REFUSE ROUGH SEWER APPURTENANCES,
ter-Miller Associates, Inc., Waltham, Mass.
primary bibliographic entry see Field 5D.
6-05070

ETREATMENT AND ULTIMATE DISPOSAL WASTEWATER SOLIDS,
ironmental Protection Agency, New York. Re-
n II.
primary bibliographic entry see Field 5D.
6-05079

BILIZATION OF MUNICIPAL SEWAGE DGE BY HIGH LIME DOSE,
elle Pacific Northwest Labs., Richland, Wash.
er and Waste Management Section.
primary bibliographic entry see Field 5D.
6-05081

DGE INCINERATORS IN USE TODAY T MEET THE REQUIREMENTS OF STATE FEDERAL REGULATIONS,
. Kaercher.
Research Symposium on Pretreatment and Ul-
te Disposal of Wastewater Solids, May 21-22,
, New Brunswick, New Jersey, Rutgers
ersity, p 237-244.

criptors: *Sludge, *Incineration, *Regulation,
n Air Act, Legisltionl, United States, Federal
rnment, Sludge disposal, Air pollution, Ulti-
disposal, Odor, Cyclones, Opacity, Water
r, Sludge treatment, Waste treatment.
ifiers: On-site disposal, Particulate matter,
sion controls, Multiple hearth furnace, Flash
g, Wet oxidation, Fluidized bed, Bag filters,
rostatic precipitators, Venturi scrubbers,
gement bafflers, Sludge conditioning.

e incinerators from the point of view of a
ruction supervisor are discussed. The
ems confronting sludge disposal today are
onditioning of the sludge into a suitable form
cineration and the disposal and control of the
nd emissions. Federal regulations are stated
Clean Air Act. Limits of particulate matter
ions are 0.031 grains per dry standard cubic
with opacity less than 10% except for two
es every hour. Water vapor is excluded from
limits. New Jersey regulations prohibit visi-
h and limit particulate emissions to 0.1 grains
y cubic foot. Six types of sludge incinerators
erative in the United States: multiple hearth
ce; flash drying; wet oxidation; fluidized
ncinerating a mixture of sludge cake and
refuse; and the spray drying of sludge with
heat from an incinerator and burning the
in the incinerator. Emission controls are of
pes: the dry type including cyclones, elec-
ic precipitators and bag filters; and the wet
ncluding impingement bafflers and venturi
ers. Although no regulations exist concern-
or, it must also be controlled. It has been
that multiple hearth furnaces and wet scrub-
re the most practical methods for incinera-
d air pollution control. Dangers exist in the
ual interpretation of Federal regulations.
atitude must also be made for interpretation
erent areas. (See also W76-05079) (Pinto-

5082

ECONOMIC CONSIDERATIONS FOR PLANNING SEWAGE SLUDGE DISPOSAL SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
D. A. Derr, V. Kasper Jr., M. Gould, and E. J. Genetelli.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 245-266. 7 fig, 3 tab, 3 ref.

Descriptors: *Economics, *Sewage sludge, *Sludge disposal, *Sludge, Planning, Disposal, Oceans, Storage, Dewatering, Transportation, Ultimate disposal, Landfill, Centrifugation, Cost analysis, Environmental effects, *Waste disposal.
Identifiers: Ocean disposal, Land disposal, On-site disposal, Volume reduction, Vacuum filters.

Procedures for the estimation and evaluation of costs for alternative sewage sludge disposal systems are suggested. Basic components or modes for sewage sludge disposal are identified. They are transport, dewatering, storage and site disposal. Land disposal can consist of dump truck, tank, truck, rail or pipeline. Water transport can be either by barge or pipeline outflow. Dewatering is considered for the purpose of volume reduction so that cheaper transportation may be used. Three methods in common use are sand beds, centrifuge and vacuum filters. Sewage sludge can be stored at the sewage plant or at a disposal site. Disposal methods include incineration, land disposal, landfill, and ocean disposal. The flow of activity of sludge consists of three modes: the origin, the transport, and the destination. Land disposal offers the greatest opportunity for recycle into the soil. Ocean disposal can cut dewatering costs but may require additional transportation. Costs of sludge disposal can be placed into three categories: capital investment, operating or variable costs, and fixed costs. To evaluate alternative methods of sludge disposal, in addition to investment and cost data, consideration must be given to budgetary constraints, environmental impact and risk associated with each alternative. Cost estimates from previous research provided the basis for the hypothesized solution presented. The least expensive solution would be for a sewage treatment plant located at barge docking facilities to barge sludge at 5% solids for less than 30 miles to be dumped into the ocean. The most expensive is land transport for over 17 miles and land disposal. (See also W76-05079) (Pinto-FIRL)
W76-05083

EPA'S POSITION ON OCEAN DISPOSAL IN THE NEW YORK BIGHT,
Environmental Protection Agency, New York. Region II.
R. T. Dewling, R. D. Spear, P. W. Anderson, and R. J. Braun.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1975, New Brunswick, New Jersey, Rutgers University, p 283-330. 12 fig, 13 tab, 1 append.

Descriptors: New York, *Municipal wastes, *Industrial wastes, *Sludge disposal, Coast Guard regulations, Regulations, Waste disposal, Chemical analysis, Federal Government, Ultimate disposal, Permits.
Identifiers: Maritime Protection Research and Sanctuaries Act, *New York Bight, *Ocean disposal, Industrial dumping, Municipal dumping, United States Coast Guard.

More than 70% of all municipal sludge and 60% of all industrial sludge is dumped in the area of the New York Bight. The Environmental Protection Agency became responsible for this area after the passage of the Maritime Protection, Research, and Sanctuaries Act in April, 1973, and since then significant changes have occurred. Eight industrial dumping applications/permits have been denied; forty seven dumpers were phased out and 12 additional were to be phased out by 1975; industrial waste and digestor cleanout must be dumped 106 miles offshore instead of 12 miles as before; and no new industrial or municipal dumpers have been approved since the Act was passed. A chemical and biological analysis of the wastes must be made by the dumpers and reported to the EPA; a vigorous enforcement program has been initiated with the help of the U. S. Coast Guard; and municipalities have been notified of the long range goal to completely phase out ocean dumping by 1981. (See also W76-05079) (Pinto-FIRL)
W76-05084

DISPOSAL OF SEWAGE SLUDGE TO SEA; UNITED KINGDOM EXPERIENCE AND PRACTICE,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
J. E. Portmann.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 331-348. 2 fig, 3 tab, 18 ref.

Descriptors: *Disposal, *Sewage sludge, *Sludge disposal, Ultimate disposal, Oceans, Toxins, Organic matter, Legislation, Mathematical models, Pollutants, Marine animals, Marine fish, Sediments, Radioactivity techniques, Tracers, Recreation.
Identifiers: London(UK), Glasgow(UK), Manchester(UK), Oslo and London Dumping Conventions, Land disposal, *Ocean disposal, *United Kingdom.

The experience of the United Kingdom in sewage sludge disposal to the sea is discussed. This has been common practice for large cities such as London, Machester and Glasow for over 50 years. Twenty five percent of all sewage sludge is presently dumped to the sea either by tanker or by outfall pipes. As land disposal becomes more costly and dangerous to crops, this amount is expected to increase. In the past, dumping practices have been voluntarily controlled by the Ministry of Agriculture, Fisheries and Food (MAFF). New legislation will soon come into effect as a result of the recent Oslo and London Dumping Conventions. An application will have to be made and licenses must be granted before dumping is allowed. A number of factors are considered for the selection of a dumping site. These include: navigational and operational aspects of the dumping area; safeguarding the deposits of sand and gravel for the construction industry; interference with recreation; the effects on marine resources; and the effects of toxic materials. A procedure is outlined to protect marine resources from the effects of pollution. Mathematical models and radioactive tracers are used to measure the different current flows and the rates of settlement of the solids in the sludge are determined from sludge density and particle size. Effects of the sludge on sediments, animals and fish are monitored. So far the program has been successful and only minor problems have arisen. Extensive studies conducted on the London, Glasgow and Manchester dumping grounds have shown little or no accumulations of organic matter, little metal accumulation and little or no change in species composition. (See also W76-05079) (Pinto-FIRL)
W76-05085

EVALUATING THE IMPACT OF SLUDGE DISCHARGE TO SANTA MONICA BAY, CALIFORNIA,
California Univ., Berkeley; and Southern California Coastal Water Research Project, Berkeley.
For primary bibliographic entry see Field 5C
W76-05088

A DISCUSSION OF A NEAR FIELD DISPERSION MODEL FOR SLUDGE DISCHARGES TO COASTAL WATERS,
Pacific Northwest Environmental Research Lab., Corvallis Oreg.
For primary bibliographic entry see Field 5B.
W76-05089

POLLUTION CONTROL AND SUGGESTED DISPOSAL GUIDELINES FOR CLINICAL CHEMISTRY LABORATORIES,
Edward J. Meyer Memorial Hospital, Buffalo, N. Y. Erie County Lab.
For primary bibliographic entry see Field 5G.
W76-05097

CORROSION IN DISPOSAL WELLS,
Subsurface Disposal Corp., Houston, Tex.
S. R. Owens.
Water and Sewage Works, Reference number, p R10-R12, April, 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Waste disposal, *Underground waste disposal, Injection wells, Waste disposal wells, Corrosion, Monitoring, Well screens, Well casings, Construction materials.

Industrial waste disposal wells are subject to corrosion problems such as stress-cracking, galvanic corrosion, and solvent action on elastomers. A typical disposal well contains a screen used to give uniform distribution of injection fluid. The screen is subject to stress-corrosion cracking, uniform corrosion, galvanic corrosion, and sinking. Excessive softening of the formation that supports the screen is another form of corrosion. Elastomers used in a packer must withstand the injection fluid and the injection zone liquid. They are subject to crevice and galvanic corrosion. Cement may fail if sulfur compounds are present, or if the effluent has a low pH. The tubing itself (carbon steel, stainless, or FRP) is subject to many forms of corrosion such as differential oxygen concentration cell corrosion, crevice corrosion in joints, and uniform corrosion due to acids. A corrosion test loop is recommended for most industrial waste disposal wells, where a by-pass would allow frequent evaluation of test materials. If there is a change in injection fluid, the downhole mixture should be tested as connate fluids can alter the injected matter. Caliper surveys, spinner logs, and temperature logs are ways of monitoring an injection well. (Murphy-FIRL)
W76-05125

HE USES VALUABLE RUNOFF.
Successful Farming, Vol. 73, No. 8, p. H10, June-July, 1975. 1 fig.

Descriptors: *Farm wastes, Waste disposal, Water reuse, *Agricultural runoff, *Drainage, *Feed lots, *Fertilizers, *Costs, Recycling.
Identifiers: *Waste collection, Land disposal.

Bob Atherton's Earlville, Illinois feedlot has undergone a number of low-cost alterations over the years in order to eliminate muck and runoff problems on his cement feedlot. The feedlot is 95 ft x 110 ft with a capacity of 350-375 head of cattle. The lot has an 8-10 in slope toward the middle. Liquids drain into a center outlet and buried tile and are carried to a 6 ft x 8 ft x 110 ft pit along the front of the lot. This pit collects nearly all the liquid runoff, including some loose manure. The pit is emptied about six times a year by means of a liquid spreader with a vacuum pump. A conventional loader handles the remaining solids. During winter months, Atherton tries to keep the pit about two-thirds full to prevent damage to the pit that might be caused by freezing and thawing if left empty. The system seems to work very well. A drier lot, drier bedding, and less labor have resulted in an economic savings over Atherton's original system. Final alterations for this lot cost $2,500, only about $7 per head capacity. (Cameron-East Central)
W76-05170

THE DRY DEEP PIT SYSTEM,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W76-05172

ON THE HORNS OF THE DAIRY WASTE DILEMMA,
For primary bibliographic entry see Field 5D.
W76-05175

REGULATION ADOPTING EFFLUENT LIMITAIONS AND GUIDELINES FOR WASTEWATER DISCHARGES TO THE SURFACE WATERS OF NORTH CAROLINA.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Environmental Management.
For primary bibliographic entry see Field 5G.
W76-05212

WASHINGTON WASTES DISCHARGE PERMITS.
Washington Pollution Control Commission, Olympia.
For primary bibliographic entry see Field 6E.
W76-05214

WYOMING ENVIRONMENTAL QUALITY ACT,
For primary bibliographic entry see Field 6E.
W76-05216

ALASKA WASTEWATER DISPOSAL REGULATIONS.
For primary bibliographic entry see Field 6E.
W76-05223

COMPARISON OF INORGANIC NITROGEN CONTENTS OF UNDISTURBED, CULTIVATED, AND BARNYARD SOIL PROFILES IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5B.
W76-05263

TRANSPORT PHENOMENA APPLIED TO SLUDGE DEWATERING,
Dorr-Oliver, Inc., Stamford, Conn.
For primary bibliographic entry see Field 5D.
W76-05264

INDUSTRIAL OILS, RECOVERY OR DISPOSAL. (LES HUILLES INDUSTRIELLES, RECUPERATION OU ELIMINATION.),
For primary bibliographic entry see Field 5D.
W76-05280

EFFLUENT CONTROL IN ZINC BONDERIZING PROCESSES: I. THE RECYCLE OF RINSE WATERS VIA AN ION EXCHANGE PROCESS,
Puricons, Inc., Berwyn, Pa.
For primary bibliographic entry see Field 5D.
W76-05284

MANAGING INDUSTRIAL WASTE DISPOSAL,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W76-05310

COMPLETE WATEREUSE, INDUSTRY'S OPPORTUNITY.
American Inst. of Chemical Engineers, New York.
For primary bibliographic entry see Field 5D.
W76-05314

HANDLING OF SOLIDS AND LIQUI SIDESTREAMS RESULTING FRO WATEREUSE OPERATIONS,
Canys, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W76-05317

SEPARATION OF ALGAE CELLS FRO WASTEWATER LAGOON EFFLUENTS SOIL MANTLE TREATMENT,
Utah State Univ., Logan. Div. of Environmen Engineering.
For primary bibliographic entry see Field 5D.
W76-05321

THE SEWERLESS SOCIETY,
For primary bibliographic entry see Field 5D.
W76-05439

LIQUID WASTE DISPOSAL SYSTEM,
Trane Thermal Co. Conshohocken, Pa.
For primary bibliographic entry see Field 5D.
W76-05481

TREATMENT AND SAFE DISPOSAL OF TIONIC COATING COLORS,
Merck and Co., Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W76-05488

FINAL TREATMENT OF PETROLEUM C TAINING WASTE WATERS IN HIGHSP FILTERS FOR PUMPING THEM INTO BEARING BEDS (DOOCHIS NEFT'SODERZHASHCHIKH STOCHN VOD NA SVERKHSKOROSTNYKH FIL'TR S TSEL'YU ZAKACHKI IKH V PRODUK NYE PLASTY),
For primary bibliographic entry see Field 5D.
W76-05492

5F. Water Treatment and Quality Alteration

METHYLENE PHOSPHONATES GLYCIDYL REACTED POLYALKY POLYAMINES AND USE IN SCALE CHELATION,
Petrolite Corp., St. Louis, Mo. (Assignee).
P. M. Quinlan.
U.S. Patent No. 3,926,801, 8 p, 5 tab, 7 ref cial Gazette of the United States Patent Vol 941, No 3, p 1332, December 16, 1975.

Descriptors: *Patents, *Water trea *Scaling, Water quality, *Chelation, Corr Damages, Descaling, Cations, Aqueous so Waste water treatment.
Identifiers: *Sequestering agents.

A process for inhibiting scale formation in ous systems by chelation or sequestration prises adding to the system a me phosphonate of glycidyl compound reacted kylene polyamine. The methylene phospho glycidyl compound reacted polya polyamine has nitrogen-bonded me phosphonate units and nitrogen-bonded compound reacted units. The chelat sequestering agents thus described are utility in sequestering or inhibiting precipit metal cations from aqueous solutions in lowing applications: Soaps and detergents processing, metal cleaning and scale r metal finishing and plating, rubber and pla dustry, pulp and paper industry, oilwell tr and chelation in biological systems. (Sinha-
W76-05030

IETHOD FOR REMOVING BOTH ORGANIC IATTER AND BACTERIA FROM A BODY OF 'ATER,
'ater Science, Inc., Calif. (Assignee).
Hedgpeth.
.S. Patent No. 3,926,802, 4 p, 4 ref; Official azette of the United States Patent Office, Vol 1, No 3, p 1332, December 16, 1975.

escriptors: *Patents, Water purification, Water ality control, *Water treatment, *Filtration, emical reactions, Oxidation, eduction(Chemial), Swimming pools, acteria, *Organic matter, Iodides, Carbonates, 'aste water treatment.
ntifiers: Cuprous iodide.

method and a mixture of complexes are scribed for treating bodies of water to remove cteria and organic matter. A mixture of substanly water insoluble chemical complexes includ- cuprous iodide and copper carbonate are apd to a filter system, upstream of the filter diam. The mixture coats the surfaces of the er medium and accelerates the liberation of elental iodine through the introduction of chlorine vnstream of the filter. The result is, first, that oxidation-reduction system is established by presence of the complexes on the surface of filter medium so that organic particles, bacia and algae are oxidized and destroyed as the er passes through the filter medium. Secondly, ection of the organic matter, bacteria and algae he surface of the filter medium is avoided and water is decontaminated as it flows through the r medium while the filter medium tends to ain in a free-flowing condition. (Sinha-OEIS)
5-05031

VICE FOR THE CONTINUOUS TREATNT OF LIQUID STREAMS,
ellschaft zur Wiederaufarbeitung von Kernnstoffen m.b.H., Leopoldshafen bei Karle (West Germany).
primary bibliographic entry see Field 5D.
-05033

ICE FOR MEMBRANE FILTRATION,
striele Onderneming Wavin, N.V., Zwolle herlands).
an de Putter.
Patent No. 3,926,813, 3 p 5 fig, 7 ref; Official tte of the United States Patent Office, Vol No 3, p 1336, December 16, 1975.

riptors: *Patents, *Water purification, Waste r treatment, Water quality control, Mem-, *Membrane processes, *Filtration, Separaechniques.
ifiers: *Membrane filtration.

vice for membrane filtration is comprised of tegral block provided with continuous holes. of the continuous holes are liquid impermeaid resists the pressure applied during mem- filtration, and the length of the hole is n such that the liquid passed through the ranes flows toward the end of a block gh an intermediate space between the mem- and the inner wall of the hole provided in embrane. Several blocks are connected with ther by at least one hollow drawing bar, the side of the bar being connected in a liquid ering space between two subsequent blocks. quid covering space is formed by placing the ocks onto each other and accommodating a ring between two blocks so that the blocks ld at a distance from each other. The interle space between the inner wall of a continuole and a membrane is comprised of a layer ous material and/or grooves provided in the permeable wall of a hole. The porous materinon-woven synthetic resin material. (Sinha -
5037

READILY ATTACHABLE WATER FILTER WITH CUTOFF VALVE,
Aqua-Chem, Inc., Milwaukee, Wis. (assignee)
For primary bibliographic entry see Field 8C.
W76-05038

A GUIDE TO THE INTERSTATE CARRIER WATER SUPPLY CERTIFICATION PROGRAM.
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
For primary bibliographic entry see Field 5G.
W76-05040

EVALUATION OF WATER LABORATORIES, RECOMMENDED BY THE UNITED STATES PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C. Bureau of State Services.
For primary bibliographic entry see Field 5G.
W76-05041

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
Report EPA-430/9-74-007, Revised 1974. 155 p, 28 fig, 8 tab, 40 ref, 4 append.

Descriptors: *Water supply, *Legislation, *Water quality standards, *Groundwater, Wells, Surface waters, Rural areas, Water treatment, Pumps, Construction materials, Hydrologic aspects, Water pollution control.

This manual is a revision of a 1962 publication and is concerned with the needs of individuals or institutions who must choose alternative water supplies. Information has been published for use by Federal agencies, State and local health departments, well drillers, contractors and individual homeowners. Recommended practices as defenses against contamination must be practical; costs must be consistent with benefits; and changes must make an important contribution to the useful life of the installation. This manual is divided into five sections: selection of a water source; groundwater; surface water for rural use; water treatment; and pumping, distribution, and storage. Appendices are also included which provide information on a recommended procedure for cement grouting of wells for sanitary protection, sampling for bacteriological quality, and for emergency disinfection. A suggestion for drafting a local ordinance to permit legal controls over nonpublic groundwater supply systems used for domestic purposes has also been prepared. (Kramer-FIRL)
W76-05042

A PILOT STUDY OF DRINKING WATER SYSTEMS AT BUREAU OF RECLAMATION DEVELOPMENTS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
Report EPA-430-9-73-004, June, 1973. 5 fig, 11 tab, 2 append.

Descriptors: *Potable water, *Reservoirs, *Water quality, Water pollution control, On-site investigations, Analytical techniques, Chemical analysis, Bacteria, Monitoring, Water quality standards, State jurisdiction, Potable water, Water supply, Coliforms, Water treatment, Pollutant identification.
Identifiers: Bacteriological analysis, Drinking water standards.

A pilot survey of 58 drinking water supply systems at 26 Bureau of Reclamation reservoirs assessed the water quality, construction, maintenance, operation, and surveillance of these systems. Field work was completed in October and November of 1971 and was divided between flood control and irrigation reservoirs in Kansas and California, and along the Colorado River. Bacteriological samples were collected of the distribution-system water, of the raw water, and at all hand-pumped wells. Complete chemical and physical analyses were made, and chlorine residuals were measured at each sampling point. In addition, the distribution system pressure was determined. Findings of the study indicated that 33 (57%) of the systems delivered water that failed to meet at least one constituent limit of the Drinking Water Standards. Fourteen systems (24%) did not meet at least one mandatory chemical or bacteriological limit and seven of the systems (12%) were contaminated with coliform bacteria. Only four (7%) of the systems practiced a bacteriological surveillance program that met the Public Health Service Drinking Water Standard criteria. To im rove the water quality it was recommended that State and county governmental agencies should initiate and maintain an acceptable program of bacteriological and chemical surveillance and provide regular sanitary surveys of the water system. An adequate surveillance program would cost about $200 per system. The Bureau of Reclamation should also maintain closer control of the water systems around their reservoirs. (Kramer-FIRL)
W76-05043

WATER WORKS PLANT STATISTICS.
Water and Pollution Control Directory, Vol. 113, No. 10, p 48-66, October, 1975. 11 tab.

Descriptors: *Treatment facilities, *Potable water, *Water treatment, *Water supply, *Municipal water, Water quality, Statistics, Costs, Design, *Canada, Waste water treatment.
Identifiers: *Water works plant statistics.

A comprehensive listing of Canada's municipal water works facilities is presented. The information was gathered from many municipalities and regulatory agencies, and serves as a national reference. Eleven tables are provided which detail the characteristics of each facility; these are arranged alphabetically by province. Included are: raw water characteristics (pH, total hardness, turbidity, and color); population served; actual population; source of water supply; ownership of system; type of treatment (aeration, chlorination, carbon, flocculation, filtration, fluoridation, iron removal, sedimentation, softening, sludge treatment, nutrient removal); plant design capacity; storage capacity; number of service connections, including domestic, industrial and commercial; costs per thousand gallons; and potable water supplied to other municipalities. (Kramer-FIRL)
W76-05055

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland). Control of Environmental Pollution and Hazards.
For primary bibliographic entry see Field 5G.
W76-05061

WASTE MANAGEMENT SYSTEM,
For primary bibliographic entry see Field 5E.
W76-05063

A PILOT STUDY OF DRINKING WATER SYSTEMS IN THE NATIONAL PARK SERVICE,
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 494, $4.75 in paper copy, $2.25 in microfiche. Report EPA-520/9-74-016, December, 1974. 77 p, 7 fig, 9 tab, 4 append.

Descriptors: *Waste water treatment, *Water treatment, *Potable water, *Water quality control, *Water supply, Analytical techniques, Chemical analysis, Bacteria, Maintenance, Operation, Sampling costs, Pollutant identification, Legislation, Water quality standards, *National parks.

Identifiers: Bacteriological analysis, National Park Service.

A pilot study was conducted to assess the construction, water quality, operation, maintenance, and surveillance of water supplies on National Park Service Lands. Forty-two water systems in two geographical areas (Maryland, Pennsylvania and Virginia in the East and Arizona and California in the West) were chosen for field investigations. At each water system, samples were collected for bacteriological, chemical and physical analyses; distribution system pressure was determined; and chlorine residuals were measured. It was found that 48% (twenty systems) did not comply with at least one of the constituent limits of the 1962 United States Public Health Service Drinking Water Standards. Eleven systems failed to meet one or more mandatory limits, including fluoride, mercury, and lead. It was recommended that for these supplies, the presence of such metals should be continuously monitored and evaluated. Where bacteriological contamination was found, it was suggested that improved source protection and attention to the sanitary conditions is needed. Only about half the systems tested had an acceptable bacteriological surveillance program. Additionally, none of the chemical analyses performed at any facility included all of the constituents in the Drinking Water Standards. It was also found that, in general, these systems lacked adequate source protection, operation, and control. It was recommended that the National Park Service should place a higher priority on initiating and maintaining further bacteriological and chemical surveillance programs. Costs for adequate programming would be approximately $360 per system. (Kramer-FIRL)
W76-05090

CROSS-CONNECTION CONTROL MANUAL.
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Report EPA-430/9-73-002, 1973. 57 p, 35 fig, 4 tab, 13 ref, 8 append.

Descriptors: *Plumbing, *Pipelines, *Sewerage, *Water distribution(Applied), Joints(Connections), Water conveyance, Hydraulic engineering, Potable water, Water pollution sources, Public health, Control, *Control systems, *Water quality control.
Identifiers: *Cross-connections.

A cross-connection is a link or channel which connects a source of pollution with a potable water supply. The polluting substance tends to enter the potable supply if the net force acting upon the liquid is in the direction of the potable supply. Cross-connections present a public health problem. Well-documented cases exist where cross-connections have been responsible for the contamination of drinking water and the spread of disease. Control of cross-connections is possible by the application of knowledge and vigilance. All municipalities witH public water supplies should have cross-connection control programs. This manual is designed as a guide for health officials, water works personnel, and plumbers to use in educational, administrative, and technical ways in conducting cross-connection control programs. Topics which are discussed include: public health significance of cross-connections; the theory of backflow and backsiphonage; methods and devices for backflow prevention; testing procedures for backflow preventers; administration of a cross-connection control program; and, cross-connection control ordinance provisions. (Orr-FIRL)
W76-05092

HISTORY AND DEVELOPMENT OF AWWA STANDARDS,
Alvord, Burdick and Howson, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-05096

POLLUTION CONTROL AND SUGGESTED DISPOSAL GUIDELINES FOR CLINICAL CHEMISTRY LABORATORIES,
Edward J. Meyer Memorial Hospital, Buffalo, N. Y. Erie County Lab.
For primary bibliographic entry see Field 5G.
W76-05097

CHARACTERIZATION OF USAGE AND WASTEWATER IN ROADSIDE REST AREAS,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5D.
W76-05102

WYOMING PROTECTION OF PUBLIC WATER SUPPLY ACT,
For primary bibliographic entry see Field 6E.
W76-05217

HEALTH ASPECTS OF UNCOVERED RESERVOIRS,
Washington State Dept. of Social and Health Services, Olympia.
J. C. Pluntze.
American Water Works Association Journal, Vol. 67, No. 8, p. 432-437, August 1975. 6 p, 3 fig, 14 ref.

Descriptors: *Reservoirs, *Public health, *Water pollution sources, *Potable water, *Cost benefit theory, Chlorination, Water quality control, Water purification, Economics, Tangible benefits, Water quality standards, Standards, Water policy, Algae, Taste, Odor, Technology, Research and development, Economic feasibility.
Identifiers: Uncovered reservoirs, Vandalism, Potable water standards, Covered reservoirs.

Open reservoirs do not fit in with today's attitudes, standards, conditions, knowledge or technology. The view that health authorities should specify only the end point for water quality and not concern themselves with how it is achieved is in disfavor. Just because the water coming out of the tap meets the bacteriological and chemical parameters in the federal drinking-water standards does not necessarily mean that water supply systems are operating as they should. Several of the reasons presented for eliminating open reservoirs are: (1) post chlorination is not effective on many viruses; (2) seagulls and other disease carrying birds are common inhabitants of open reservoirs; (3) aquatic growths present potential taste, odor, and debris problems; and (4) acts of vandalism are easily perpetrated. Reservoirs can be covered to eliminate these problems but the cost is currently prohibitive. There is evidence, however, that the costs of covering reservoirs need not be unreasonable, though caution will have to be exercised to insure that roofs are watertight, perimeter drainage adequate, and screens and vents properly constructed so as to keep out birds, debris and algae. Otherwise, closed reservoirs will create more problems than they will solve. (Hoffman-Florida)
W76-05232

EVALUATION OF STATE DRINKING-WATER-QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5G.
W76-05233

WATER TREATMENT--TECHNIQUE FOR ENERGY CONSERVATION,
Betz Entec, Inc., Trevose, Pa.
L. B. Astbury, and P. J. Gaughn.
Plant Engineering, Vol. 29, No. 21, p. 139-141, 1975. 3 fig.

Descriptors: *Water treatment, *Energy loss, Ai conditioning, Cooling water, Heat transfer, Scal ing, Fouling, Corrosion control, Water softening Demineralization, Boilers, Automatic contro Water conservation, Steam turbines, Efficiencies
Identifiers: Blowdown.

Benefits resulting from process and air-conditio ing cooling water treatment systems are discusse Cooling water system heat transfer efficiency adversely affected by scale, fouling, and corr sion. Scale can be controlled by softenin demineralization, and chemical treatment; inc ganic fouling with dispersants; microbiologic fouling with biocides; and ferrous metal corrosi by proper water characteristics, temperature, flo rate, and contact of metal with dissimilar meta Treatments include threshold programs usi polyphosphates which control corrosion, sca and pitting. To further improve cooling wa system operating efficiency and cut energy nee dispersants are used to keep solids suspended water and maintain maximum heat transfer a blowdown to control of dissolved and suspend solids. Relationships expressing normal water c sumption in cooling systems show that water chemicals are conserved if cooling water syste are operated at high concentration cycles; wa saved will be proportional to size of the syst Automatic controls of variations in optimum and cycles of concentration save chemic water, energy, and labor. Plant steam turbine e ciency depends on quantity and temperature heat received and rejected. Principles for coo water systems also apply to industrial air-co tioning systems. Large installations offer more portunities for energy savings. (Buchanan-Da son--Wisconsin)
W76-05438

IMPACT OF THE SAFE DRINKING WA ACT,
Environmental Protection Agency. Washing D. C.
For primary bibliographic entry see Field 5G.
W76-05449

STATE REGULATORY AGENCIES AND SAFE DRINKING WATER ACT,
New Jersey Dept. of Environmental Protec Trenton, N. J. Bureau of Potable Water.
For primary bibliographic entry see Field 5G.
W76-05450

THE RELATIONSHIP BETWEEN SUBSTR CONTENT, WATER QUALITY, ACT MYCETES, AND MUSTY ODORS IN BROAD RIVER BASIN,
Environmental Protection Agency, Athens Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W76-05478

5G. Water Quality Control

FEASIBILITY OF REGIONAL UTILITIES MANAGEMENT OF INDUSTRIAL AND NICIPAL WASTES,
Michigan Dept. of Commerce, Lansing. Off Economic Expansion.
D. Poxson.
Available from the National Technical Inf tion Service, Springfield, Va. 22161. as P 452, $7.75 in paper copy, $2.25 in micro Completion Report, December 1974. 207 pend. OWRT C-2158(No.3374)(1).

Descriptors: *Water pollution control, *Po taxes(Charges), *Regional analysis, *Mic *Waste disposal, *Industrial wastes, *Mu wastes, Organizations, Water laws, Publi ties, Legislation, *Regulation, Water m ment(Applied).

dentifiers: State authority, State agencies, Resource recovery Commission.

An effort was made to determine the feasibility of stablishing regional organizations which, with tate revenue bond backing, would provide waste isposal services to industries and municipalities or a fee. Interviews were conducted with industri- l firm owners, managers, and technical operators nd local government officials and waste plant perators in a selected region of Michigan to ob- ain their views on the proposed regional organiza- on. Also, other states regional waste disposal ws were reviewed for use as possible models for Michigan program. Recommendations included a roposal that a state authority an independent gency be formed, but should it be housed in an xisting agency, it should be a non-regulatory one. long with the study and resulting from informa- on derived, legislation has been passed creating a source recovery commission rather than an uthority.
76-05003

OOKERY BAY LAND USE STUDIES, EN- IRONMENTAL PLANNING STRATEGIES OR THE DEVELOPMENT OF A MANGROVE IORELINE, STUDY NO. 3, ESTUARINE ATER QUALITY,
onservation Foundation, Washington, D. C.
J. Yokel.
vailable from the National Technical Informa- n Service, Springfield, Va 22161, as PB-250 120 .00 in papper copy, $2.25 in microfiche. Partial mpletion Report, June 1975. 95 p 21 fig, 10 tab, ref. OWRT C-4022(No. 9004)(7), C-1817(No. 70(7), C-2201(No. 3385(7).

scriptors: *Environmental effects, *Estuarine vironment, *Florida, Temperature, Salinity, tuaries, Dissolved oxygen, Turbidity, osphates, Bays, Sulfates, Fluorides, Chromi- , Copper, Iron, Detergents, Color, Biological ygen demand, Coliforms, Bacteria, Land use, sticides, Red tide, Hydrogen ion concentration, llutant identification, *Water quality.
ntifiers: Naples(Fla), *Rookery Bay Sanctua- Fla).

study of water quality was conducted in and r the Rookery Bay Sanctuary, a mangrove uary system south of Naples on the southwest st of Florida in 1970-72. Observations were le on a series of physical, chemical and biologi- parameters, including temperature, salinity, olved oxygen, pH, turbidity, total ortho- and a-phosphate sulfate, fluoride, chromium, per, iron, detergents, true color, biological ox- n demand, coliform bacterial counts and pesti- s. Data on precipitation, stream discharge and eral geomorphological features of the area are provided. The environmental effects of chan- ed discharge, a severe drought and an out- k of red tide are discussed in relation to cer- parameters.
-05005

OKERY BAY LAND USE STUDIES, EN- ONMENTAL PLANNING STRATEGIES THE DEVELOPMENT OF A MANGROVE RELINE, STUDY NO. 5, ESTUARINE LOGY,
ervation Foundation, Washington, D. C.
Yokel.
lable from the National Technical Informa- Service, Springfield, Va. 22161, as PB-250 121 in paper copy, $2.25 in microfiche. Partial pletion Report, June 1975. 112 p, 23 fig, 18 64 ref. OWRT C-4022(No. 9004)(8), C- No. 3170)(8), C-2201(No. 3385)(8).

riptors: *Benthos, *Crustaceans, *Mollusks, , Temperature, Salinity, Dissolved oxygen, lation, Algae, *Florida, *Estuarine environ- , *Environmental effects, Bays, Data collec- , *Systematics, Regression analysis, Land

Identifiers: Rookery Bay Sanctuary(Fla), Naples(Fla), Seagrasses.

This study presents data on the distribution and relative abundance of animals from four major benthic habitat types in Rookery Bay Sanctuary near Naples, Fla. Quantitative monthly samples were taken during darkness using a 10-foot otter trawl over a period of 27 lunar months (June 1970-July 1972). A total of 328,239 animals were collected and identified representing over 200 species and 11 major taxa of animals. Catches were dominated by crustaceans, mollusks and fish which accounted for 96 percent of the total catch and 85 percent of the species. A species list is provided for the major taxa with monthly catch rates and observed ranges of temperature, salinity and dissolved oxygen for each species. Detailed statistical and biological analyses are provided for 14 species representing the dominant members of the major taxa. For the selected species a two-way analysis of variance was used to test the difference among habitats and the seasonal effect represented by months. A stepwise multivariate regression analysis was conducted for each of the selected species to evaluate the contribution made by dissolved oxygen concentration, salinity, temperature and vegetation weight in explaining the observed variation in catch rates. Results showed the vast majority of animals were found in habitats that contained segrasses and benthic algae. Conversely there were only small differences in the species counts between habitats. For the 14 species tested, vegetation weight accounted for a statistically significant part of the variation in 11 species, salinity was significant in 6, and temperature in 3.
W76-05006

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 7, POLICY AND REGULATORY DIMENSIONS,
Conservation Foundation, Washington, D. C.
T. M. Alexander, and J. J. Bosley.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 122 $4.50 in paper copy,$2.25. in microfiche. Partial Completion Report, June 1975. 61 p, 40 ref. OWRT C-4022(No. 9004)(9), C-1817(No. 3170)(9), C-2201)(No.3385)(9).

Descriptors: Effects, *Regulation, *Land use, Administration, *Florida, *Planning, *Water policy Environmental, Coasts, Estuaries, Bays, *Land development.
Identifiers: *Rookery Bay(Fla), *Coastal management, *Coastal development.

Past and evolving coastal management policies and their application through planning and regulation in the Rookery Bay Area of Collier County, Florida, is the focus of this study. A case study of a major shoreline development proposal adjacent to the Rookery Bay Sanctuary is presented to highlight the key changes and conflicts in coastal management over the past few years. The major problems, issues and conclusions drawn from this local experience are then placed within the context of recent expansion and changes in Federal and Florida law and policy. Specific issues that must be addressed in order to deal more effectively with coastal developments in the future are set forth. These are followed by a discussion of the opportunities presented by passage of coastal zone management legislation in Florida and by the Congress. Recommendations are made to strengthen the application of the regulatory dimension locally in Collier County and in the broader framework of Florida and national policy.
W76-05007

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 9, PRINCIPLES OF ECOSYSTEM MANAGEMENT,
Conservation Foundation, Washington, D.C.
J. Clark, and P. J. Sarokwash.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 123 in paper copy, $2.25 in microfiche. Partial Completion Report, June 1974, 17 p. OWRT C-4022(No. 9004)(10), C-1817(No. 3170)(10) C-2201(No. 3385(10).

Descriptors: Estuarine environment, *Ecosystems, *Land use, *Urbanization, *Decision making, *Estuaries, *Florida, Ecology, Conservation, Mangrove swamps, City planning, Coastal marshes, Wetlands, Flood plain zoning, Land classification, Watershed management.
Identifiers: *Coastal zone management, Coastal water, Environmental management, Residential growth, Collier County(Fla).

The protection of estuarine ecosystems requires a comprehensive coastal zone management program with specific environmental controls set within this larger framework. Control elements must be derived from characteristics of the ecosystem involved and designed to achieve the best level of ecosystem function possible. The basic management unit must be a complete coastal ecosystem including both the coastal water basin and related adjacent shorelands. Within this unit, components of vital importance to certain species or to the functioning of the entire ecosystem must be classified as vital areas and protected from significant alteration and pollution. Coastal floodplain may be designated an area of environmental concern or conservation area, protected by stringent controls on development, or designated a buffer area to protect vital areas along a shoreline. Specific management practices required to minimize disturbance of the coastal environment include controls on development activities which affect water circulation, temperature, salinity, turbidity, oxygen, nutrient supply, levels of toxic substances, and vital areas. Ecosystem requirements and recommended management practices applicable to south Florida are discussed, as are certain types of vital areas of south Florida, the ecological functions they perform, and their major vulnerabilities to disturbance.
W76-05008

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 10, GROWTH AND LAND USE, STUDY NO. 11, ECONOMIC IMPLICATIONS OF LAND DEVELOPMENT ALTERNATIVES, STUDY NO. 12, A SIMULATION MODELING APPROACH TO THE STUDY OF DEVELOPMENT ALTERNATIVES,
R. A. Lemire, R. K. Davis, R. M. Hirsch, J. C. Zieman, and G. M. Hornberger.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 124, $4.50 in paper copy, $2.25 in microfiche. Partial Completion Report, June 1975. 58 p, 5 fig, 5 tab, 19 ref. OWRT C-4022(No. 9004)(11), C-1817(No. 3170)(11), C-2201(No. 3385)(11).

Descriptors: *Florida, *Environmental effects, *Land use, Bays, Human population, Growth rates, *Land development, Economics, *Alternative planning, *Model studies, Ecosystems, *Estuarine environment.
Identifiers: *Rookery Bay(Fla), Collier County(Fla).

Study No. 10 attempts to link the population growth that poses a threat to Rookery Bay to the future economic, social and ecological stability of Collier County. A brief statistical survey was conducted; and a strategy for advocacy participation in the local planning and regulatory processes is recommended as the most effective way to deal with development threats to Rookery Bay. Study No. 11 sets up a number of prototype housing

developments appropriate to the Southwest Florida market and the location and topography of the study area. Each prototype is examined for its profitability and for its effects on Rookery Bay, estimated as the residential value of the land after all costs except environmental effects are estimated from total population, acreage of impervious surface and similar parameters. In Study No. 12 the simulation model was structured into four sub-models: (1) land use; (2) watershed and hydrology; (3) estuarine hydrodynamics, and (4) estuarine ecology. The relationship of these sub-models to one another is discussed.
W76-05009

FLOATING OIL FENCE,
J. M. Poche.
U.S. Patent No. 3,925,991, 5 p, 12 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1075, December 16, 1975.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution control, Floating, Floats, Pontoons, Offshore platforms, Pollution abatement.
Identifiers: Floating fence, Oil tankers.

A rectangle of sealed flexible coupled interlocking pontoons make up a floating fence to confine and contain oil on a body of water in an area of almost any proportion. The coupled pontoons provide work space on and below the deck of the pontoons as well as space for skimming equipment and storage space for salvaged oil. The pontoons have an interlocking device that couples them in a manner that allows for lateral roll and horizontal movement. The fence may also be provided with an electromagnetic coupler to couple the oil fence to the side of an oil tanker or other vessel in order to form a rectangular containment around an oil spill. The fence may also be used around a fixed offshore structure such as a drilling platform. Operation of the interlocking structures is such that they require only a minimum of mechanisms and parts. The oil fence can be formed into any desired size to increase and/or to reduce the containment area by merely adding or removing one or more of the interlocking pontoons. (Sinha - OEIS)
W76-05020

FLOATAGE CONCENTRATING EQUIPMENT FOR NAUTICAL FLOATAGE RECOVERY APPARATUS,
J B F Scientific Corp., Burlington, Mass. (assignee).
R. W. Neal.
U.S. Patent No. 3,926,812, 5 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1336, December 16, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution treatment, Water pollution control, Water quality control, Flotsam, Jetsam, Skimming, Oil wastes, Ships, Equipment.
Identifiers: Booms, Sweeps.

A nautical vessel is equipped with an apparatus for concentrating and recovering floating material from the surface of a body of water particularly in heavy seas. Sweeps are deployed forward of a vessel in such a manner that they are continuously on the surface of the water. The deployment of each sweep from the vessel allows the sweep to move vertically, i.e. heave, and to rotate about a transverse horizontal axis, i.e. to pitch, along a path that carries the heel of the sweep into the bow opening without collision with the vessel. The doubly-articulated deployment of each sweep allows it to move freely about the two parallel axis of rotation but constrains the longitudinal axis of the sweep from movement other than along the normally vertical plane which passes through it. The result of these constrains is that the heel of each sweep enters the bow opening of the vessel when the sweep undergoes heavy sea motion. A barrier fixed to the vessel and in sliding engagement with the sweep during heavy sea motion maintains an essentially leak-proof sealing engagement with the sweep throughout this motion. Each sweep is deployed on a mounting boom hinged to the vessel. (Sinha-OEIS)
W76-05036

A GUIDE TO THE INTERSTATE CARRIER WATER SUPPLY CERTIFICATION PROGRAM.
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
Report EPA-520/9-74-024, June, 1975. 16 p, 1 fig, 1 tab.

Descriptors: *Water supply, *Potable water, Standards, *Water quality control, Legislation, Interstate, *Water quality standards, Water transfer, Transportation.
Identifiers: *Interstate carrier water supply certification.

The certification of water supplies for interstate carrier use is the responsibility of the Environmental Protection Agency, Regional Water Supply Division (ROW). Three safe-for-use certifications are necessary before water can be used on an interstate carrier: the watering point must be certified; the water supply must be certified; and, the bacteriological laboratory must be certified. This guide sets forth the criteria and procedures to be followed when classifying interstate carrier water supplies. It is an aid to the interpretation of the Drinking Water Standards designed to be used by persons responsible for ensuring potable water for interstate travelers. Bases for classification, a classification list, classification definitions, and classification criteria are discussed as well as water supply surveys and use prohibited notifications . Excerps from the Public Health Services Drinking Water Standards are presented. (Orr-FIRL)
W76-05040

EVALUATION OF WATER LABORATORIES, RECOMMENDED BY THE UNITED STATES PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C. Bureau of State Services.
Public Health Service Publication No. 999-EE-1, 1972. 54 p, 2 append.

Descriptors: *Water analysis, *Laboratory tests, Analytical techniques, *Public health, Potable water, Pollutant identification, *Water quality standards.

A major part of the Public Health Service Drinking Water Standards deal with laboratory methods and the technical competency of laboratory personnel. Bacteriological results may be accepted from State Health Department laboratories, local government laboratories, water works authorities, and commercial laboratories if these laboratories are approved for use by the Reporting Agency and the Public Health Service. This publication gives performance standards for the evaluation of the bacteriological laboratory procedures and equipment as required by the 1962 Edition of the Public Health Service Drinking Water Standards and the 12th Edition of Standard Methods for the Examination of Water and Wastewater. A survey form is included which is the official public health service form to be used in evaluatinglaboratories. Guidelines to be followed when making an evaluation are presented. (Orr-FIRL)
W76-05041

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
For primary bibliographic entry see Field 5F.
W76-05042

PHOSPHORUS MOVEMENT IN SOILS THEORETICAL ASPECTS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-05048

A SUPPLEMENTAL SOCIO-ENVIRONMENTAL DECISION TOOL: VALUE CONFLICTS OF LONG ISLAND,
Weston (Roy F.) Inc., Roslyn, N.Y.
For primary bibliographic entry see Field 5D.
W76-05049

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland). Control of Environmental Pollution and Hazards.
R. Helmer.
WHO Chronicle, Vol. 29, No. 11, p 428-434, 1975.

Descriptors: *Monitoring, *Water quality control, *Water quality standards, Water pollution control, Waste water(Pollution), Industrial wastes, Storm runoff, Environmental effects, Potable water, Public health.
Identifiers: World Health Organization.

The role of the World Health Organization (WHO) in all aspects of water pollution control is outlined. Sources of water pollution are described, including municipal, industrial and agricultural wastes, waters and urban runoff. Problems relating to water use, such as water supplies, recreational and agricultural uses, and water reuse are discussed. Water quality criteria and standards at an international level have been supported by the World Health Organization. A revision of the International Standards for Drinking-Water is being completed; guidelines detail minimal water quality requirements consistent with the health protection attainable in all member countries. WHO activities in water quality monitoring are also presented, involving the Global Environmental Monitoring System initiated by the United Nations Environment Programme (UNEP). (Kramer-FIRL)
W76-05061

USE OF ENVIRONMENTAL ANALYSES IN WASTEWATER FACILITIES BY LOCAL GOVERNMENT,
Teknekron, Inc., Washington, D.C. Applied Research Div.
For primary bibliographic entry see Field 5D.
W76-05072

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
J. R. Hyland.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 [illegible] $7.00 in paper copy, $2.25 in microfiche. Report EPA-430/1-74-005, June, 1974. 169 p.

Descriptors: *Legislation, *Regulations, *Oil spills, *Oil wastes, *Separation techniques, Waste treatment, Analytical techniques, Training, Personnel, Environmental effects, Water pollution control, Pollutant identification.
Identifiers: Training manuals, Oil pollution prevention.

A course manual has been prepared for employees of regulatory agencies who are responsible for responding to nonrecurring discharges of oil. Hazardous materials are defined; procedures for personal safety during spill cleanup operations are detailed. Characteristics of various types of oil are described, including chemical and physical analyses, the biological effects of such pollutants and the microbiology of petroleum. Water pollution control techniques by dispersants, sin

ents, burning agents, gelling agents, surface col-cting agents, and sorbents are outlined. Oil water parator designs are also provided. Additionally, e chapter discusses the legislation affecting oil, tional and regional contingency plans, and EPA pollution prevention regulation. (Kramer-RL.)
76-05073

DIOVISUAL INSTRUCTIONAL UNITS FOR ATER POLLUTION CONTROL TRAINING OGRAMS,
vironmental Protection Agency, Cincinnati, io. Office of Water Program Operations.
E. Donahue.
ailable from the National Technical Informa-n Service, Springfield, Va 22161, as PB-237 456, 75 in paper copy, $2.25 in microfiche. Report A-430/1-74-016, November, 1974. 34 p.

scriptors: *Training, *Personnel, *Water pollu-control, Activated sludge, Waste water treat-nt, Water treatment, Treatment facilities.
ntifiers: *Audiovisual instruction.

diovisual instructional units currently used for ning personnel in water pollution control are logued in this document. These units were eloped to be used with an instructor as training port and are not self-contained teaching ces. Titles and details on the subject matter of tape/slide set are provided; subject areas in-e activated sludge processes, anaerobic stion, various chemical procedures, chlorine lment plants, safety in waste water works, c statistics, and details on how to produce /slide presentations. Included in this catalogue formation on how to purchase or borrow the ous instructional units. (Kramer-FIRL)
-05074

NICIPAL WASTEWATER TREATMENT RKS CONSTRUCTION GRANTS, ERENCES, REGULATIONS, GUIDANCE, CEDURES.
ronmental Protection Agency, Washington, Office of Water Program Operations.
primary bibliographic entry see Field 5D.
-05075

'S POSITION ON OCEAN DISPOSAL IN NEW YORK BIGHT,
ronmental Protection Agency, New York. Re-II.
rimary bibliographic entry see Field 5E.
05084

OSAL OF SEWAGE SLUDGE TO SEA; ED KINGDOM EXPERIENCE AND PRAC-,
try of Agriculture, Fisheries and Food, ham-on-Crouch (England). Fisheries Lab.
rimary bibliographic entry see Field 5E.
05085

ORY AND DEVELOPMENT OF AWWA DARDS,
l, Burdick and Howson, Chicago, Ill.
Richardson.
can Water Works Association Journal, Vol. 11, Part 1, p A33-A37, November, 1975. 1 ab.

ptors: *Waste water treatment, *Water ent, *Standards, *Publications, Water pol-control, Construction, Pipes, Engineering, quality standards, History.
iers: *AWWA standards.

andardization program of the American Works Association (AWWA), which has ngoing for 100 years, includes standards as books, manuals, and handbooks developed by the organization. The definition of a standard is presented as, 'something established for use as a rule or basis of comparison in measuring or judging capacity, quantity, extent, value, or quality. The AWWA Standards Council has been responsible for the development of publications on standards; currently one book, five manuals and 69 existing standards are being reviewed and two new manuals and 28 new standards are being developed. A listing of present AWWA standards is providing, defining materials, substances, products, equipment, systems, procedures, and services as they relate to the water supply field. Proposed new standards on steel pipe, plastic pipe, swing check valves, and prestressed water tanks are also discussed. Additionally, the development of the 14th edition of Standard Methods for the Examination of Water and Wastewater is summarized. AWWA standards program offers benefits to the manufacturer, the engineer, and the consumer. (Kramer-FIRL)
W76-05096

POLLUTION CONTROL AND SUGGESTED DISPOSAL GUIDELINES FOR CLINICAL CHEMISTRY LABORATORIES,
Edward J. Meyer Memorial Hospital, Buffalo, N. Y. Erie County Lab.
D. A. Pragay.
Clinical Chemistry, Vol. 21, p 1839-1844, 1975. 7 tab, 6 ref.

Descriptors: *Waste water disposal, *Chemicals, *Laboratories, *Disposal, Hospitals, Liquid wastes, Waste disposal, New York, Water pollution, *Water pollution control, Public health.
Identifiers: *Clinical chemistry laboratories, Disposal guidelines, Buffalo(NY), Rochester(NY), Permissible levels.

Clinical chemistry laboratories may be discharging pollutants in considerable amounts. Surveys were conducted in hospitals in the Buffalo and Rochester, New York, metropolitan areas. Results showed that amounts of silver, arsenic, cyanide, chromium, copper, iron, mercury, zinc, acids, picrate and other organic solvents were being discharged. A stepwise procedure consisting of three phases was suggested on how to begin pollution control in clinical laboratories. The three phases were data collection, a short range remedial procedure and a long range remedial program. In the data collection phase four steps are required: a complete inventory of all liquid wastes of the laboratory should be made; an updated list of permissable levels of harmful pollutants should be obtained; the inventory of pollutants and the list of permissible levels should be cross-matched; and details of the laboratory sewer line must be determined. The short range remedial procedures consist of collecting the waste, disposing of the waste, obtaining a library of waste related reference material and cataloging and characterizing each waste according to its harmfulness and methods of disposal. The long range remedial program consists of devising methods that generate less pollutants, introducing new standards on hospital and equipment construction and safety, teaching ecology and safety consciousness to hospital personnel and offering and accepting the cooperation of other laboratories. Brief guidelines on waste disposal for different harmful wastes are given. (Pinto-FIRL)
W76-05097

POLLUTION CONTROL IN THE SWEDISH PULP AND PAPER INDUSTRY,
Swedish Pollution Control Co., Stockholm.
For primary bibliographic entry see Field 5D.
W76-05108

TREATMENT TECHNIQUE FOR HARMFUL SUBSTANCES IN WATER POLLUTION (SUISHITSU ODAKU KANKEI YUGAI BUSHITSU SHORI GIJUTSU),
For primary bibliographic entry see Field 5D.
W76-05123

MATHEMATICAL MODELS PREDICT CONCENTRATION-TIME PROFILES RESULTING FROM CHEMICAL SPILL IN A RIVER,
Dow Chemical U. S. A., Midland, Mich. Health and Environmental Research.
For primary bibliographic entry see Field 5B.
W76-05155

A LIVESTOCKMAN'S GUIDE TO POLLUTION LAWS,
R. Lutz.
Successful Farming, Vol. 70, p. 42-43, 50, October, 1972. 1 fig.

Descriptors: *Farm wastes, *Legal aspects, *Regulation, *Feed lots, Water pollution, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin.

Laws are outlined for the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. Addresses of Agencies charged with supervision of agricultural pollution in the 12 states are included. (East Central)
W76-05171

LEGAL IMPLICATIONS OF FEEDLOT POLLUTION IN NEBRASKA,
Nebraska Univ., Lincoln. Coll. of Agriculture and Home Economics.
D. C. Nelson.
Publication SB 529, Agricultural Experiment Station, University of Nebraska, Lincoln, 24 p. (n.d.).

Descriptors: *Farm wastes, *Legal aspects, *Feed lots, *Nebraska, Nuisance, Negligence, Trespass, Common law, Odor, Dust, *Water pollution control, Pollution abatement.
Identifiers: Noise, Pests.

The common law and statutory legal implications of feedlot pollution in Nebraska are examined. The fundamental inquiry in Nebraska is to determine whether the feedlot operation violates the accepted rule of decency and substantially depreciates the value of the nearby property. The judicial precedents of such inquiry are discussed in terms of odor, dust, noise, water contamination and pests. The common law theories of nuisance, negligence and trespass are examined. Statutory measures are also discussed and suggestions are made for ways to reduce the chances of legal suits against feedlots due to pollution. (Penrod-East Central)
W76-05173

THE EFFECTS OF A MARSH ON WATER QUALITY,
Hope Coll., Holland, Mich. Dept. of Biology.
E. D. Greij.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 498, $4.00 in paper copy, $2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, E. Lansing, February, 1976. 24 p, 7 fig, 11 tab, 4 ref. OWRT A-077-MICH(1). 14-31-0001-5022.

Descriptors: *Water quality, Vegetation, *Nutrients, Cattails, *Marshes, *Emerging vegetation stage, *Michigan, Eutrophication, Lakes.
Identifiers: *Black River(Mich), Ottawa County(Mich), Holland(Mich), *Cattail marsh, Duckweed growth, Eutrophic lakes.

The primary purpose was to determine the effects of a cattail marsh on water quality. The use of emergent vegetation to improve water quality has been reported by several workers and was suggested by preliminary work on this marsh. The

study area was a cattail marsh located where the Black (Macatawa) River meets Lake Macatawa in Ottawa County at Holland, Michigan. The marsh was very dense as recently as 1971, but has continued to become more open until 1974-1975 when it was essentially a eutrophic lake. Several aspects of the study are discussed: (1) changes in nutrient levels above and below the marsh, (2) changes in nutrient levels within selected stands of cattail, (3) changes in nutrient levels in cattail enclosures, (4) marking cattail to determine export loss, (5) water levels and cattail distribution, (6) separation of cattail mat from underlying substrate, and (7) duckweed growth.
W76-05182

POLLUTION -- SHIPOWNERS' LIABILITY NOT LIMITED BY LIMITATION OF LIABILITY ACT. THE OCEAN EAGLE, 1974 AMC 1629 (DPR 1974) (DICTUM),
J. D. Kimball.
Journal of Maritime Law and Commerce, Vol. 6, No. 4, p. 661-64 (1975), 4 p.

Descriptors: *Ships, *Water pollution sources, *Costs, *Navigation, *Oil pollution, Oil spills, Judicial decisions, Transportation, Water, Water law, Legal aspects, Water pollution, Oceans, Bodies of water, Pollution, Puerto Rico, Damages, Panama Canal.
Identifiers: *Limitation of Liability Act, Wreck Act, Refuse Act, Oil Pollution Act.

The precise limit of shipowners7 liability for pollution damage has remained uncertain since the Supreme Court's decision in Askew v. American Waterways Operators. In the opinion of some commentators, that decision supports the view that a shipowner's liability to a state or private citizen will be limited in accordance with the Limitation of Liability Act (the Act), regardless of the fact that liability is based on a valid state statute. Although there has been no definitive ruling on the question, federal courts have repeatedly voiced dissatisfaction with the Act. In In re Chinese Maritime Trust, Ltd., the court held that the costs incurred by the Panama Canal Company, an agent of the United States, in removing a wrecked ship from the Panama Canal were not subject to the Act. The question of whether the Company's additional claim under the Oil Pollution Act was subject to the Limitation of Liability Act was not presented to the court, and thus remained unanswered. In a recent decision, The Ocean Eagle, the court stated in dictum that the Act would not limit liability where the polluting vessel had violated the Wreck Act, the Refuse Act, and the Oil Pollution Act. (Schilling-Florida)
W76-05184

PROTECTING PUBLIC HEALTH FROM HAZARDOUS SUBSTANCES: FEDERAL REGULATION OF ENVIRONMENTAL CONTAMINANTS,
Environmental Law Inst. Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-05185

COMPELLED SELF-DISCLOSURE AND CIVIL PENALTIES: THE LIMITS OF CORPORATE IMMUNITY IN OIL SPILL CASES,
D. F. Dietz.
Boston University Law Review, Vol 55, No. 1, p. 112-133 (1975), 22p.

Descriptors: *Oil spills, *Judicial decisions, *Water Quality Act, *Rivers and Harbors Act, *Water pollution control, Supervisory control(Power), Federal government, Administration, Regulation, Jurisdiction, Decision making, Water pollution sources, Oil, Oily water, Navigation, Navigable waters, Coast Guard regulations, Legal aspects, Water law.
Identifiers: Corporate polluters, *Water Quality Improvement Act of 1970, Civil penalties, Fines, United States v LeBeouf Brothers Towing Co, United States v Mobil Oil Corporation, Refuse Act.

In recent years, Congress has increasingly employed civil penalties in the enforcement of regulatory legislation, because, unlike criminal sanctions, they can be imposed by administrative agencies without the constitutional protections afforded defendants in criminal prosecutions. However, in United States v. LeBeouf Brothers Towing Co., the civil penalty provision of the Water Quality Improvement Act was found to be criminal in nature, and the defendant, who had reported an oil spill from one of its ships as required by the Act, was declared entitled to statutory immunity under the Fifth, Sixth, and Fourteenth Amendments. If LeBeouf is upheld, it may undermine the operation of the 1970 Act by allowing those responsible for oil spills to escape liability as long as they report them. Another key question, considered in United States v. Mobil Oil Corp., is whether such immunity should be extended only to persons and not to corporations. The Court in Mobil decided that the penalty provisions of the Act did entitle corporations to invoke their constitutional rights. This decision has been much criticized, and it remains to be seen whether the appeals court in LeBeouf will follow it. (Parrish-Florida)
W76-05186

DEFICIENCIES IN THE REGULATORY SCHEME OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
T. F. Linn.
St. Louis University Law Journal, Vol. 19, p. 208-222 (1974), 15 p.

Descriptors: *Federal Water Pollution Control Act, *Water pollution control, *Legal aspects, *Navigable waters, Regulation, Federal government, Legislation, Penalties(Legal), Federal jurisdiction, Judicial decisions, Commerce, Water law, Economics, Costs, Path of pollutants, Pollutants, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality, Water quality control, Industries.
Identifiers: *FWPCA Amendments of 1972.

The scope of the Federal Water Pollution Control Act (FWPCA) is clearly restricted to the discharge of pollutants into 'navigable waters' while discharges into non-navigable waters escape most, if not all, of the Act's stringent water pollution control requirements. Individual decisions dating back to 1870 have determined that the term 'navigable waters' refers only to those bodies of water within the United States which are navigable for the purpose of commerce. All other waters are not protected by the FWPCA. Since costs of pollutant removal generally rise geometrically as increased removal is required, there may be an incentive for unscrupulous major polluters to relocate to areas where their discharges will not enter navigable waters, thus defeating the purpose of the Act. (Nursey-Florida)
W76-05187

ENVIRONMENTAL PROTECTION AND THE ROLE OF THE CIVIL MONEY PENALTY: SOME PRACTICAL AND LEGAL CONSIDERATIONS,
For primary bibliographic entry see Field 6G.
W76-05188

ENVIRONMENTAL PROTECTION IN CALIFORNIA: COURT ACTION POWERS OF STATE AND LOCAL GOVERNMENT ATTORNEYS,
For primary bibliographic entry see Field 6G.
W76-05189

ENVIRONMENTAL CLASS ACTIONS IN THE FEDERAL COURTS - PEERING THROUGH THE ZAHN SMOG,
For primary bibliographic entry see Field 6E.
W76-05190

COMMON LAW REMEDIES FOR SALT POLLUTION,
For primary bibliographic entry see Field 6E.
W76-05191

STATE REGULATION OF FEDERAL WATER APPROPRIATIONS: THE CALFORNIA EXPERIENCE,
California State Dept. of Justice, San Francisco.
For primary bibliographic entry see Field 6E.
W76-05192

MINING AND THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972
Amax, Inc., Denver, Colo. Law Dept.
P. Keppler.
Rocky Mountain Mineral Law Institute Annua
Vol. 20, p. 501-540 (1975), 40 p.

Descriptors: *Water quality control, *Feder Water Pollution Control Act, *Mining, *Mining i dustry, Agencies, Regulation, Permits, Erosio control, Federal government, State government Planning, Decision making, Water Quality Ac Erosion, Environmental control, Water, Wat law, Legal aspects, Environmental effects.
Identifiers: Effluent limitations, Federal Wat Pollution Control Act Amendments of 1972, No point source(Pollution), Groundwater pollution.

The 1972 amendments to the Federal Water Poll tion Control Act totally restructure national wa pollution control efforts. Previously, state wa quality standards were the only federally impos programs. The Amendments shift the empha from water quality standards to control of po source pollution. Two aspects have particu relevance to the mining industry. National Pol tion Discharge Elimination System (NPDES) p mits must be secured before final effluent limi tion guidelines are established for a particular dustry. The EPA has indicated that such perm will remain effective notwithstanding the s sequent issuance of more stringent guidelin However, if the water quality of a receiv stream deteriorates below current applicable st dards, a permit is subject to revocation or mod cation. A second problem is that an NPDES per is required only for effluent discharges i navigable waters. Further, pollution from min operations usually results from non-point sour However, the EPA Administrator is charged w promulgating guidelines for identifying and c trolling non-point source pollution. The re recommends that erosion and sedimentation c trol be incorporated in surface mining and re mation programs. The 1972 Amendm represent an enormous challenge to the mining dustry to develop methods for controlling eliminating pollution from both point and n point sources. (Jenkins-Florida)
W76-05193

THE COLORADO RIVER SALINITY PROBL WITH MEXICO,
H. Brownell, and S. D. Eaton.
American Journal of International Law, Vol No. 2, p. 255-271 (1975), 17 p.

Descriptors: Salinity, *Desalination pl *Desalination processes, *Colorado R *Mexican Water Treaty, *Mexico, Treaties, W purification, Water treatment, Desalination paratus, Drainage, Water quality, Saline w Water supply, Water sources, Water dem Arizona, Desalination wastes, International United States, Irrigation, Irrigation water, I tion efficiency, Water pollution sources.
Identifiers: *Imperial Dam(Calif).

linity levels in the Colorado River have been a ntinuous sore spot in U. S. relations with Mex-; with the history of the problem going back to 1944 United States-Mexico Treaty for Utiliza- n of Waters of the Colorado River. The prin- al area of disagreement has been the difference quality between the water available to U. S. rs below the Imperial Dam and the water ivered to Mexico at the northerly international ndary. Two events occurred in 1961 to bring quality issue to the fore: the pumping of highly n drainage from the Welton-Mohawk Irrigation l Drainage District of Arizona into the Colorado er; and the reduction of excess water received Mexico due to intensified river use within the S. A task force formed to consider the quality blem, proposed three possible solutions: (1) ination of the pollution source; (2) substitution Imperial Dam quality water for the Welton- hawk drainage; and (3) desalinization of the lton-Mohawk system. An analysis of these e proposals, as well as other issues raised by salinity problem, is presented to show why the ted States decided upon the construction of a alination complex. (Hoffman-Florida)
-05194

INOIS ENVIRONMENTAL LAW--THE NEW AULT ON WATER POLLUTION,
kbert, Rooks, Pitts, Fullagar and Poust, ago, Ill.
). Freeborn.
aul Law Review, Vol. 24, No. 2, p. 481-509 5), 29 p.

criptors: *Permits, *Navigable waters, lution abatement, *Adoption of practices, ois, Missouri River, Industries, Standards, nology, Jurisdiction, Rivers and Harbors Act, ral Water Pollution Control Act, Constitu- l law, Federal government, State govern- s, Effluents, Administrative agencies, Regu- ns.
ifiers: *Federal Water Pollution Control FWPCA) Amendments of 1972, Refuse Act of Citizen suits, Enforcement, Industrial pollu- Environmental Protection Agency(EPA), nal Pollution Discharge Elimination System DES).

article surveys the series of steps taken in Il- to implement the Federal Water Pollution ol Act Amendments of 1972. The Amend- s shift emphasis in the nation's water pollu- ontrol program from a system of water quali- ndards to a new system of effluent limita- as well as mandating a permit system to be istered under the auspices of the Environ- l Protection Agency (EPA). The author es various problems in the implementation Amendments' policies arising from (a) cer- nclear language used in the Amendments elves, (b) uncertainty as to when a permit is ed, and (c) prolonged delays in the permit process. If these problems are not speedily ed, some states may again resort to using un- but seemingly simpler, statutory devices as the Rivers and Harbors Act of 1899. h-Florida)
5198

RADO RIVER SALINITY PROBLEM: SOLUTION BEEN FOUND,
Univ., Colo. Coll. of Law
mary bibliographic entry see Field 6E.
5200

CONOMICS OF CLEAN WATER - 1973.
nmental Protection Agency, Washington,

ber 1973. 120 p, 5 fig, 68 tab.

tors: *Federal Water Pollution Control Cost allocation, *Water pollution control, mics, *Economic prediction, Water pollution sources, Waste treatment, Cost benefit analysis, Economic justification, Municipal wastes, Industrial wastes, Industrial water, Phosphorous, Pollutants, Water pollution treatment, Tangible benefits, Nitrates, Water pollution sources, Industries, Oxygen demand.
Identifiers: Nonpoint pollution.

This report is the sixth of a series of reports sent to Congress as required by Section 516(b) of the Federal Water Pollution Control Act (FWPCA). It deals with a wide variety of topics, including: (1) nature of and trends in water pollutants; (2) municipal costs; (3) industrial costs; (4) nonpoint pollution; (5) benefits from water quality enhancement; and (6) economic constraints on pollution programs. Highlights of the report indicate that bacteria and oxygen consuming substances, the pollutants receiving the most widespread attention, showed general improvement over the last five years. However, phosphorous and nitrates, the primary pollutants contributing to eutrophication, increased over the last five years in many of the river basins tested. Surveys estimate that the cost of constructing the municipal treatment and collection facilities eligible for Federal funding under the 1972 FWPCA Amendments will be $60 billion (1973 dollars). Of this amount, $36 billion is needed for waste treatment plants and interceptor sewers, and $24 billion for correction of infiltration / inflow problems, new collectors, and combined sewer overflows. Industry will be required to invest about $12 billion in treatment facilities, not including thermal treatment plants, to meet the 1977 goals set for it. This, it is estimated will require private industry to invest approximately $3.5 billion annually. (Hoffman-Florida)
W76-05203

COAST GUARD MISCELLANEOUS-PART 2(CONVENTION ON HIGH SEAS POLLUTION H. R. 5975).
Hearing Subcomm. on Coast Guard and Navigation--Comm. on Merchant Marine and Fisheries, U. S. House of Representatives, 93d Cong, 2d Sess., p. 1-70, October 2,3, 1973. 70p.

Descriptors: *Legislation, *Oil pollution, *Disaters, *International waters, *Federal Water Pollution Control Act, Law of the sea, Oil industry, Foreign trade, Environmental effects, Coasts, Beaches, Structural engineering, Federal government, Foreign countries.
Identifiers: Convention on Oil Pollution in the High Seas, Oil pollution effects, Territorial seas, Energy crisis, Hearings, Ship structures.

H. R. 5975 implements the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969. The bill authorizes the Secretary of the Department in which the Coast Guard is operating to take such measures as are necessary to prevent, mitigate, or eliminate threats to the coastline or related interests from oil pollution resulting from maritime accidents beyond the territorial seas of the U. S. On October 2 and 3, 1973, the House Subcommittee on Coast Guard and Navigation heard representatives from the Coast Guard and Environmental Protection Agency (EPA) testify to support the bill. H.R. 5975 extends the authority of the federal government beyond that established under the Federal Water Pollution Control Act to international waters. Several witnesses testified that the vessel of a non-signatory nation would be subject to the Convention. The rights existing under the bill pertain only to governmental bodies. Private persons whose vessels or cargo suffer excessive damages due to intervention, may subject to state law, sue in a district court, or submit their claims to the Secretary of State for arbitration. The global energy shortage and increased size of oil tankers require enactment of the bill to minimize damage to marine and coastal environments and energy wastage coused by oil spills. (Jenkins-Florida)
W76-05205

TENNESSEE VALLEY AUTHORITY POLLUTION PREVENTION FACILITIES.
For primary bibliographic entry see Field 6E.
W76-05208

EXTENSION OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972.
Senate Comm. on Commerce, No. 93-1279, 93rd Cong., 2d Sess. Oct. 11, 1974. 6 p.

Descriptors: *Federal Government, *Legislation, *Waste disposal, *Water pollution control, *Oceans, Water, Water law, Legal aspects, Water pollution, Pollution, Wastes, United States, Governments, Costs, Permits, Waste dumps.
Identifiers: *Marine Protection Research, and Sanctuaries Act of 1972, *Ocean Dumping Act, International agreements, Territorial waters.

The Committee on Commerce has recommended passage of H.R. 15540 in order to extend for one year the authorization for appropriations implementing Title I of the Marine Protection, Research, and Sanctuaries Act of 1972. This statute, commonly referred to as the Ocean Dumping Act, is the Federal Government's mechanism for controlling and regulating the dumping of land-generated wastes at sea. The Act imposes specific research resonsibilities on the National Oceanic and Atmospheric Administration, in addition to the general permit responsibility of the Environmental Protection Agency and of the Army Corps of Engineers. The Act is being extended for one year to enable the Committee to conduct oversight hearings during the first session of the 94th Congress. Further extension will depend on the findings from such congressional investigation. The Committee estimates that the additional cost to the government as a result of the enactment of this legislation would not be more than $5.5 million for one year. Agency comments from the Environmental Protection Agency, the Council on Environmental Quality, the Department of Justice, and the Department of Commerce are included in this report. (Schilling-Florida)
W76-05209

REGULATION ADOPTING EFFLUENT LIMITAIONS AND GUIDELINES FOR WASTEWATER DISCHARGES TO THE SURFACE WATERS OF NORTH CAROLINA.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Environmental Management.
Regulation of North Carolina Environmental Management Commission, March 20, 1975. 148 p.

Descriptors: *Surface waters, *Federal Water Pollution Control Act, *Effluents, *Standards, *North Carolina, Regulation, Waste water disposal, Waste water treatment, Water quality control, Water policy, Intergovernmental relations, Sewage effluents, Water pollution, Municipal wastes, Industrial wastes, Environmental control, Adoption of practices, Administrative agencies, Outlets, Domestic wastes, Streams.
Identifiers: Effluent standards, Pretreatment facilities.

This regulation authorizes and directs the North Carolina Environmental Management Commission to develop, adopt, modify and revoke effluent standards as necessary to prevent, abate and control water pollution. Limits are established for all effluents discharged from pretreatment facilities, outlets and point sources into state surface waters. The limits have been adopted from those promulgated by the Environmental Protection Agency (EPA) pursuant to the Federal Water Pollution Control Act. The North Carolina regulation provides effluent limits for all municipal wastewater discharges, including both domestic and industrial wastewater. In addition, the regulation restricts discharge into stream segments designated as 'effluent limited segments' by requiring approval by the Commission Director. (Hoffman-Florida)
W76-05212

WASHINGTON WASTES DISCHARGE PERMITS.
Washington Pollution Control Commission, Olympia.
For primary bibliographic entry see Field 6E.
W76-05214

OIL SPILLAGE REGULATION.
For primary bibliographic entry see Field 6E.
W76-05215

WYOMING ENVIRONMENTAL QUALITY ACT,
For primary bibliographic entry see Field 6E.
W76-05216

WYOMING PROTECTION OF PUBLIC WATER SUPPLY ACT,
For primary bibliographic entry see Field 6E.
W76-05217

MONTANA ENVIRONMENTAL POLICY ACT,
Montana Environmental Quality Council, Helena.
For primary bibliographic entry see Field 6E.
W76-05218

NEBRASKA DOMESTIC AND INDUSTRIAL LIQUID WASTES DISPOSAL RULES.
Nebraska Environmental Control Council, Lincoln.
For primary bibliographic entry see Field 6E.
W76-05219

KANSAS AGRICULTURAL WASTES REGULATIONS.
For primary bibliographic entry see Field 6E.
W76-05220

MICHIGAN GENERAL PROVISIONS AND PROCEDURES REGULATIONS.
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
For primary bibliographic entry see Field 6E.
W76-05221

LICENSING AND REGULATION OF USE OF OIL SPILL CLEANUP AGENTS.
For primary bibliographic entry see Field 6E.
W76-05222

FEDERAL LEGISLATION AND COMMON LAW ASPECTS OF ENVIRONMENTAL PROBLEMS IN CANADA,
Atlantic Richfield Canada Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 6E.
W76-05231

HEALTH ASPECTS OF UNCOVERED RESERVOIRS,
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 5F.
W76-05232

EVALUATION OF STATE DRINKING-WATER-QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
D. H. Taylor, and G. D. Hutchinson.
American Water Works Association Journal, Vol. 67, No. 8, p. 428-431, August, 1975. 4 p, 1 illus, 5 tab, 11 ref.

Descriptors: *Water supply, *Potable water, *Environmental sanitation, *Water distribution(Applied), *Water purification, Chlorination, Florida, Tennessee, Kentucky, Georgia, Evaluation, On-site investigations, Surveys, Quality control, Water analysis, Costs, Regulation, Water quality standards, Planning.
Identifiers: *Drinking Water Standards, Public Health Standards.

Four state water-supply programs were the subject of a recently concluded Environmental Protection Agency (EPA) study. The study had been initiated to evaluate the effectiveness of the state programs and to make recommendations as to how they could be improved. Areas reviewed included: the framework of water-supply statutes within which the programs operated; the staffing and leadership of the programs; educational opportunities for water-utility operators; and the overall effectiveness and capabilities of bateriological and chemical laboratories. The effectiveness of the program, however, was measured largely on the basis of drinking water quality, adequacy and condition of water-system facilities, and water-supply surveillance. The results of the study showed that numerous deficiencies existed, including: lack of top level quality personnel; failure to meet bacteriological water quality standards; inadequate engineering inspections of system facilities, failure to maintain a chlorine residual throughout the distribution system; and inadequate employee training. While the study noted that there were numerous factors contributing to these deficiencies, it singled out inadequate funding as the primary problem. Unless this funding problem is resolved, the study saw little chance for improvement in water quality programs. (Jenkins-Florida)
W76-05233

PERMITS FOR CONSTRUCTION BELOW HIGH WATER MARK.
South Carolina State Budget and Control Board, Columbia.
For primary bibliographic entry see Field 6E.
W76-05240

HEAT DISSIPATION FROM TURBULENT OPEN CHANNEL FLOW,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05248

THE TRI-STATE COASTAL ZONE MANAGEMENT PERSPECTIVES.
Tri-State Regional Planning Commission, New York.
For primary bibliographic entry see Field 6G.
W76-05260

FIELD-LEVEL PLANNING FOR AREAWIDE WASTE TREATMENT MANAGEMENT: A MODEL FOR PLANNING UNDER SECTION 208 OF THE FEDERAL WATER POLLUTION CONTROL ACT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 5D.
W76-05261

THE LARGE-SCALE REGIONAL PLANT HYPOTHESIS: DISCRIMINANT ANALYSIS,
Kentucky Univ., Lexington. Dept. of Economics.
J. R. Marsden, D. E. Pingry, and A. Whinston.
Water Resources Research, Vol. 11, No. 6, p 1013-1017, December 1975. 1 fig, 4 tab, 2 equ, 5 ref. OWRT A-024-IND(10).

Descriptors: *Data collections, Analysis, *Treatment facilities, *Water quality control, Regions, Efficiencies, Activated sludge, Economics, Costs, Biochemical oxygen demand, Equations, Systems analysis, Classification, Waste water treatment, Regional analysis.
Identifiers: *Discriminant analysis.

Since their inception, controversy has surrounde
the federal Water Pollution Control Act amend
ments of 1972, especially those sections dealin
with basin and regional planning of desired wate
quality and treatment procedures. Implementatio
of pollution control acts requires the compilatio
of vast amounts of data. This paper considers th
use of discriminant analysis for analyzing the co
sistency of data. Focusing on the predictive us
of the technique, the development of classificatio
procedures is discussed for use in consideri
hypotheses concerning economies of scale a
relative large-scale efficiency in treatment faci
ties. Considered is the hypothesis that large-sca
(regional plants) possess certain characteristi
which provide lower average cost benefits . T
problem studied employs classes of treatme
plants separated by average cost of treatme
using data for activated sludge plants varying
design size from 0.2 to 60 mgd. To conclude , t
classification technique can provide a cheap a
very easy method for initial considerations
questions concerning the advantage of large-sc
or regional plants. Results ran according to
'lowering average cost' arguments (higher-r
plants yield lower average costs). Lower aver
cost plants also tend to average higher M
(million gallons treated). (Bell-Cornell)
W76-05267

MEETING EPA STANDARDS WITH REVER OSMOSIS,
Universal Oil Products Co., Del Mar, Calif. R
Div.
For primary bibliographic entry see Field 5D.
W76-05295

FIGHT FLOATABLES WITH CHEMICALS,
Gannett, Fleming, Corddry and Carpenter,
Harrisburg, Pa. Applied Science Group.
For primary bibliographic entry see Field 5D.
W76-05305

OIL-WATER SEPARATOR.
Netherlands Patent NL 7305-409. Issued Oct
22, 1974. Derwent Netherlands Patents Abstr
Vol. V, No. 45, p H1, December, 1974.

Descriptors: *Patents, *Separation techni
*Oil wastes, Waste water treatment, Oil pollu
Equipment, Water pollution control, Poll
abatement.
Identifiers: *Oil/water separator.

An oil/water separator has been patented.
designed for the purification of oil polluted
and the subsequent recovery of the oil.
process involves separating from water the m
als of lower density, such as oil, that can for
ferent phases with the water. Oily water is p
to a collecting bell situated in the stream of
The less dense impurity is then discharged th
this bell. (Orr-FIRL)
W76-05306

TREATMENT OF WASTE OIL AT THE KE WORKS--NIPPON KOKAN,
Keihin Works, Kawasaki (Japan).
For primary bibliographic entry see Field 5D
W76-05312

COMPLETE WATEREUSE, INDUSTRY'S PORTUNITY.
American Inst. of Chemical Engineers, New
For primary bibliographic entry see Field 5D
W76-05314

THE RATIONALE OF ZERO DISCHARGE
For primary bibliographic entry see Field 5D
W76-05315

LEARING UP THINKING ON POLLUTION AWS,
J. Fannin.
Complete WateRuse: Industry's Opportunity, ril 23-27, 1973, American Institute of Chemical gineers and Environmental Protection Agency-- chnology Transfer.

scriptors: *Water utilization, *Water reuse, gal aspects, Legislation, Water pollution con-, Costs, Economics.
ntifiers: Legislation effects.

address was given on the political aspects of er use. The tasks of a politician today are made icult by various factors such as: the prolifera- of scientific information; the abundance of ple proposing new goals and regulations; and influence of the mass media. Environmental slation should follow a certain process; the blem should be determined; the costs to reach solutions should be evaluated; and targets and hedule that can be afforded should be set. A or concern should be the social and economic s of environmental goals. The energy crisis ld also be considered. Oil cannot be imported ices on exports are inflated by the high costs ollution control. Pollutant removal can have a tive environmental effect if too much energy resources are required to remove pollutants f more pollution is caused by the process. The of cleaning the final small fraction of pollu- can be exorbitant. Economic impacts of pol- n control usually occur in small communities h can least afford them. Optimum solutions result from the combination of economics, ef- ncy, and technology. The reuse of resources, ding water, is advocated.(See also W76-4) (Pinto-FIRL)
-05316

RADING WASTEWATER STABILIZATION DS TO MEET NEW DISCHARGE STAN-DS.
Water Research Lab., Logan.
rimary bibliographic entry see Field 5D.
05319

GRESS REPORT: BLUE SPRINGS DON STUDY, BLUE SPRINGS, MISSOURI,
onmental Protection Agency, Kansas City, Water Quality Lab.
rimary bibliographic entry see Field 5D.
05323

-EFFECTIVENESS ANALYSIS FOR ER POLLUTION CONTROL,
al Environmental Research Center, Cincin- Ohio.
imary bibliographic entry see Field 5D.
5324

OCIAL WELL-BEING AND QUALITY OF DIMENSION IN WATER RESOURCES NING AND DEVELOPMENT.
State Univ., Logan. Inst. for Social Science ch on Natural Resources.
mary bibliographic entry see Field 6B.
3354

L WELL-BEING: PROBLEMS AND ECTS,
State Univ., Corvallis. Dept. of pology.
nary bibliographic entry see Field 6B.
368

C PARTICIPATION IN WATER AND WATER PLANNING,
n Univ., S. C. Dept. of Environmental s Engineering.
nary bibliographic entry see Field 6B.
371

WESTERNPORT BAY ENVIRONMENTAL STUDY 1973-1974.
Victoria Ministry for Conservation, Melbourne (Australia). Westernport Bay Environmental Study.
For primary bibliographic entry see Field 6G.
W76-05404

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
For primary bibliographic entry see Field 5C.
W76-05405

EFFECTS OF AIR INJECTION AT PROMPTON LAKE, WAYNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
J. L. Barker.
Journal of Research of the U S Geological Survey, Vol 4, No 1, p 19-25, January-February 1976. 6 fig, 4 tab, 12 ref.

Descriptors: *Aeration, *Hypolimnion, *Lakes, *Pennsylvania, Mixing, Water temperature, Dissolved solids, Dissolved oxygen, Nitrogen, Anabaena, Data collections, Evaluation, Hypolimnion, Air pollution effects.
Identifiers: *Prompton Lake(Pa), *Air injection(Lakes).

Air injected into the hypolimnion of Prompton Lake, Wayne County, Pa., at a maximum rate of 210 cubic feet per minute (6 cubic metres per minute) during a 65-day period (July 27 to September 30, 1973) produced the following results: (1) With cooler air temperatures prevailing, the mean subsurface temperature increased by 4.0 deg C compared with the same period in 1972, (2) although chemical and thermal destratification was incomplete, 6 weeks of air injection increased the dissolved-oxygen concentration of the entire tropholytic zone to more than 4 milligrams per litre, (3) concentrations of nitrogen increased in the trophogenic zone during air injection, and (4) Anabaena flos-aquae attained cell concentrations in excess of 4,500 per millilitre during air injection. (Woodard-USGS)
W76-05413

AN INTERNATIONAL CENTRE FOR MANATEE RESEARCH.
National Academy of Sciences, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-05433

A METHOD FOR APPLYING RESEARCH TO ENVIRONMENTAL PLANNING AND MANAGEMENT: A CASE STUDY OF ISSUES IMPORTANT TO THE CHESAPEAKE BAY REGION,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W76-05434

LEFT BEHIND--SOVIET MINE WASTES,
N. Precoda.
Environment, Vol. 17, No. 8, p. 14-20, 1975. 24 ref.

Descriptors: *Environmental effects, *Foreign countries, *Mine wastes, *Mining, Quarries, *Strip mine wastes, Land Reclamation.
Identifiers: *USSR, Zambia.

Mining and quarrying operations in the USSR have severely damaged the land, and surface and underground water systems. About 5.5 million acres are covered by abandoned and operating surface mines alone increasing by nearly 100,000 acres every year. Land has also been consumed by reservoirs, highway systems, growing cities, and expanding industries, but mining operations have been the most disruptive. Disposal of tailings and other wastes needs special attention when the mining operations are in mountainous areas. Examples are given of coal and iron mining and quarrying in the Caucasian Mineral Waters Region; iron ore mining in the Kursk Magnetic Anomaly; mining of coal, manganese, and many other minerals in the Donbass Basin Area; and surface coal mining in the Kuznetz Coal Basin. Concern is expressed for the top layers of soil which are being destroyed by erosion, mining, and quarrying. In contrast to this despoliation of land the Soviet Union is making tremendous efforts to increase and improve agricultural lands. There is a crucial need in both the U.S. and USSR to change their attitudes toward reclamation of mined areas. Knowledge and resources are available to renovate used land. Conversely Zambia has allocated a large share of its national resources to the repair of land damaged by mining. (Buchanan-Davidson--Wisconsin)
W76-05437

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS.
Ernst and Ernst, Washington, D.C.
Corps of Engineers Institute for Water Resources Contract Report 74-2, July 1973. 167 p, 7 fig, 8 tab, 40 ref, append. DACW71-72-C-0053.

Descriptors: *Methodology, *Water quality, *Water supply, *Water demand, Treatment facilities, Optimization, Marginal costs, Linear programming, Mathematical models, Water treatment, Cost analysis, Water users, Resource allocation.

A conceptual framework and methodology for explicitly incorporating water quality factors into the supply and demand functions of water and resource allocation problems is developed and illustrated. A microeconmics approach using constrained optimization is employed. The water-supply function is developed by means of a classical economics model (CEM) derivation of a treatment plant's marginal cost function; this enables computation of the marginal cost of removing incremental amounts of a water impairment. A linear programming model (LPM) is developed to demonstrate how it is possible to depict internal behavior of a water-using producer who can alter the effective supply by upgrading lower quality water to acceptable quality. Actual data were used in the CEM to help estimate a sample cost function, while dummy data was used to demonstrate the sensitivity analysis capabilities of the LPM. Costs of removing water contaminants can be estimated with both models. Water demand functions are also developed and illustrated. Combining these with the CEM examples, the sensitivity of 'marginal revenue equals marginal cost' equilibrium to water quality parameter shifts is examined by means of comparative statistics analysis. (Luedtke-Wisconsin).
W76-05440

COST ALLOCATION FOR A REGIONAL POLLUTION TREATMENT SYSTEM,
Florida Univ., Gainesville, Dept. of Agricultural Economics.
E. Loehman, D. Pingry, and A. Whinston.
In: Economics and Decision Making for Environmental Quality, J. R. Conner and E. Loehman, Eds., Gainesville University Press of Florida, 1974, p 223-249. 3 fig, 9 tab, 14 equ, 9 ref. OWRT B-020IND(192)-14-31-0001-3080.

Descriptors: *River basins, *Cost allocation, *Waste disposal, *Water pollution control, *Economic efficiency, *Waste treatment, Optimization, Water quality, Standards, Flow, Physical properties, Financing, Taxes, Equations, Effluents, Pricing, Pollution abatement, Constraints, Alternative planning, Mathematical models, Systems analysis, Treatment, Structures, *Indiana, Regional analysis.

Identifiers: *Nonlinear programming, *Cost minimization, West Fork White River(Ind).

Considered is the problem of allocating the waste disposal capacity of a river basin. A model predicts water quality in a river as a function of flow and physical characteristics and gives costs of treatment on site for polluters along the river and in regional treatment plants. Nonlinear programming is used to minimize the sum of construction, operation and maintenance costs of all treatment structures; subject to maintaining the required level of water quality under given institutional and physical constraints, the least-cost combination of treatment alternatives is considered. Discussed is how to implement and finance a basin-wide system--specifically, how to achieve a minimum-cost regional solution through taxation and incentive systems. Considered is the problem where joint use of facilities by polluters causes difficulties in how to assign costs to the individual polluters. Previous pricing proposals are discussed with attention paid to shadow or marginal prices, and a new method of cost allocation is presented: a system of finance which would provide incentives for regional treatment plants. The cost allocation and pricing mechanisms are discussed regarding equity considerations and revenue-raising capability. The relationship between equity and 'damage cause' is examined. An application of the programming and cost allocation model to the West Fork White River in Indiana is given. (See also W73-02937) (Bell-Cornell)
W76-05442

INTERNATIONAL EXTERNALITIES AND OPTIMAL TAX STRUCTURES,
University of Western Ontario, London.
J. R. Markusen.
Journal of International Economics, Vol. 5, No. 1, p. 15-29, 1975. 2 tab, 11 ref.

Descriptors: *Tariff, *Mathematical models, *Pollution taxes(Charges), *Foreign trade, *International waters, Water pollution control, Air pollution, Pollution abatement, Model studies, Cost repayment.
Identifiers: *Externalities, *International pollution, Inter-regional pollution.

The problems of international pollution and the depletion of international common ocean property resources differ from the usual types of externality situations because of the restricted ability of one government to intervene in the internal affairs of another country. A model is developed applicable to two countries in a trading relationship which attempts to incorporate the underlying similarities of a wide range of problems characterized by externalities between national and regional decision making bodies. The model assumes a situation in which one country is affected by an eyesore type pollution externality generated by production processes. It is assumed that the only tool available to maximize a social welfare function is a tax structure composed of production/consumption and tariffs/subsidies. The model solves and interprets a set of necessary conditions which must be satisfied by an optimal tax structure which will maximize social welfare. Then the model is applied to distortions and optimal tax structures when the first best optimum cannot be attained. The model also serves as a vehicle to discuss a situation where only one policy instrument is available to deal with several distortions simultaneously. Several situations in which first best solutions are unavailable due to institutional constraints are considered. (Auen-Wisconsin).
W76-05446

IMPACT OF THE SAFE DRINKING WATER ACT,
Environmental Protection Agency. Washington, D. C.
J. R. Quarles, Jr.
Journal American Water Works Association, Vol. 65, No. 2, p. 69-70, February 1976.

Descriptors: *Legislation, *Administration, *Water quality control, Monitoring, *Potable water, Regulation, Water quality standards, Water law, Coordination, State governments, Local governments.
Identifiers: *Safe Drinking Water Act of 1974.

The Safe Drinking Water Act of 1974 formalized the intention of upgrading drinking water and specified assignments that require cooperation from all levels of government, utilities, and, in fact, consumers. The new act is complicated because it requires the EPA issue regulations, requires state agencies to develop programs, and requires the people who run the drinking water systems to monitor drinking water quality and make improvements. The key to success of the act will be cooperation between the EPA and state and local governments. (Gass-NWWA)
W76-05449

STATE REGULATORY AGENCIES AND THE SAFE DRINKING WATER ACT,
New Jersey Dept. of Environmental Protection, Trenton, N. J. Bureau of Potable Water.
R. Barg.
Journal American Water Works Association, Vol. 68, No. 2, p. 70-72, February 1976.

Descriptors: *State governments, *Administrative agencies, *Legislation, *Government finance, *Potable water, Regulation, Public health, Water law, *Water supply, *Water quality standards.
Identifiers: PL 93-523, *Safe Water Drinking Water Act.

A year after the passage of PL 93-523, states have begun to realize the impact of the law, which means more state work than anticipated with a minimum of federal funding. The work required of the state to carry out the new law is described. The qualifications required if the state is to apply for a federal grant to carry out community water supply supervision are discussed. The need for federal administrators to recognize basic practical and financial constraints with respect to the operation of state programs that they seek to support is expressed. (Gass-NWWA)
W76-05450

MANAGEMENT OF WATER QUALITY THROUGH SELECTED INSTITUTIONS AND INSTRUMENTS,
Iowa State Univ., Ames. Dept. of Economics.
P. H. Spies.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 034, $10.00 in paper copy, $2.25 in microfiche. PhD thesis, 1973. 338 p, 12 fig, 21 tab, 3 append. OWRT B-015-IA (5).

Descriptors: *Management, *Water quality control, *Institutions, *Iowa, Rural areas, Decision making, Coordination, Pricing, Model studies, Social needs, Comprehensive planning, Standards, Pollution taxes(Charges), Costs, Equity, Water rights, Sediment control, Feasibility, Welfare(Economics), Economic efficiency, Pollution abatement, Resource allocation, Computer programs.
Identifiers: *Upper Skunk River Basin(Iowa), Externalities.

The importance and interrelationships of planning, organization-coordination, and control of water quality management are analyzed as applicable to the water quality problem in a rural area. Spillover effects on water quality management are identified and evaluated in terms of efficiency and equity, by analyzing resource allocation within market and property systems. A model was developed for maximizing social benefits subject to specific water quality restrictions and applied to the Upper Skunk River Basin in Central Iowa. An institutional framework for water quality control was developed. Water quality planning may be simplified by application of charges to point sour pollutants and standards to diffused pollutants. allow for optimal planning and allocation of wa qualities over time, it may be necessary to spec rights in water qualities by tenure contra between public and user. Water quality mana ment should be the responsibility of regio planning groups. Research recommendations clude the provision of data for relaxing assu tions imposed on the analysis and for the insti tional design for water quality management; an procedure is needed whereby an optimal relati ship between charges and design flows can established. For tenure contracts, procedu should be established whereby qualitative spec cations and contract terms are coordinated to sure resource use efficiency. Development procedures to establish functional resou management regions is recommended. (Buchar Davidson--Wisconsin)
W76-05453

THE STATUS OF WATER POLLUTION C TROL IN THE SOVIET UNION, (FIRST PAR
Crown Zellerbach Corp., Camas, Wash. Envi mental Services Div.
For primary bibliographic entry see Field 5D.
W76-05483

THE STATUS OF WATER POLLUTION C TROL IN THE SOVIET UNION, (SEC PART),
Crown Zellerbach Corp., Camas, Wash. Env mental Services.
For primary bibliographic entry see Field 5D.
W76-05484

OXIDATION UNIT CUTS DOWN ODOR F KRAFT PULP MILLS,
Groupement de la Cellulose, Saint-Gau (France).
For primary bibliographic entry see Field 5D.
W76-05486

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ECONOMIC IMPACT OF FISCAL STRAINTS ON WATER PROJECT CONST TION, USER'S GUIDE.
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B
W76-05001

ECONOMIC IMPACT OF FISCAL STRAINTS ON WATER PROJECT CONST TION, (CARD DECK).
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B
W76-05002

STOCHASTIC PROJECTIONS FOR W RESOURCES PLANNING,
Texas Univ. at Austin. Center for Resea Water Resources.
L. R. Beard, and S. Chang.
Available from the National Technical In tion Service, Springfield, Va. 22161, as 150, $6.75 in paper copy, $2.25 in microfich Publication No. CRWR 131, November 19 p, 62 fig, 1 tab, 6 ref, 2 append. OWRT X(No. 9088)(2).

Descriptors: *Time series analysis, *Sto processes, Water resources, *Pl *Forecasting, *Projections, Probability, flow, Interest rate, Gross national produ gorithms, Model studies, *Computer Computer programs, Benefits, Costs.

entifiers: Autoregressive-integrated-moving erage processes, *Principal component analysis, ultivariate projections.

mputerized algorithms were developed for find- the best stochastic projection models for single riable projections and for simultaneous mul- ariate projections. A large number of indepen- nt projections of a single variable or a group of riables can be generated by the proposed al- ithms to represent a range of future projec- ns. Procedures, techniques, and criteria for luating the future benefits and costs of a water ources project on the basis of the entire range future projections as contrasted with the con- tional single most likely forcast were cussed. For single variable projection, the best del was selected by the algorithm from the au- egressive-integrated-moving average family of dels on the basis of goodness of fit with ob- ved data and reasonableness of projections. multivariate projections, principal component lysis was allied with the single variable projec- s, principal component analysis was allied with single variable projection technique to produce ultaneous projections of all variables. Projec- s of thirty one sample series were presented. FORTRAN computer program used in the ple series projections were listed.
-05012

ABILITY OF INTEGER PROGRAMMING GORITHMS IN SOLVING WATER OURCE PLANNING PROBLEMS,
Center for Water Resources Research, an.
Hughes, W. J. Grenney, A. B. Bishop, C. G. e, and R. Narayanan.
lable from the National Technical Informa- Service, Springfield, Va 22161 as PB-250 499, in paper copy, $2.25 in microfiche. Utah r Research Laboratory Publication G175-1, January 1976. 101 p, 5 fig, 13 tab, 59 12 append. OWRT B-125-UTAH(1). 14-34- -6127.

riptors: *Water resources, Planning, *Water y, *Algorithms, *Operations research, River s, *Optimum development plans, Utah, ional analysis, Model studies, Water quality. ifiers: *Integer programming, Cache Val- tah).

easibility of optimizing large regional water rce planning problems by means of integer amming algorithms is analyzed. Two types of r programming models are developed: (1) A supply model including 23 separate but geo- ically related community systems; and (2) a asin water quality model including 15 point s of wastewater, 4 types of pollutants, 6 sur- ce points, and 7 alternative treatment sses. The water supply model was structured ixed integer problem (some continuous vari- ncluded) while the water quality model was integer problem. Four integer programming hms were tested on the sample problems as s: (1) MXINT - The Burroughs B6700 O package algorithm; (2) FMPS-MIP - The AC 1108 MPS package algorithm; (3) T - A proprietary algorithm authored by A. offrion and R. D. McBride; and (4) AIP - A orithm which uses the Balas additive con- Several versions (sizes) of both problems uccessfully solved by one or more of the al- ns with computational efforts ranging from n 1 to more than 40 minutes of CPU time.
5183

R AS A FACTOR IN ENERGY RCES DEVELOPMENT,
Center for Water Resources Research,

mary bibliographic entry see Field 6B.
250

A RATIONAL APPROACH TO DECISION MAKING IN THE REGIONALIZATION OF WASTEWATER TREATMENT SYSTEMS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-05251

RURAL RESIDENTIAL WATER DEMAND IN KENTUCKY: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6D.
W76-05252

SCREENING MODEL FOR CONJUNCTIVE-USE WATER SYSTEMS,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-05268

A SUMMARY OF SOCIOLOGICAL STUDIES OF WATER RESOURCES DEALING WITH SOCIAL GOALS AND THE QUALITY OF LIFE: 'THE STRAWMAN' AND OTHER STUDIES,
Kentucky Agricultural Experiment Station, Lexington.
For primary bibliographic entry see Field 6B.
W76-05361

METHODOLOGICAL STRATEGIES FOR EVALUATING THE EFFECT OF WATER RESOURCES ON SOCIAL WELL-BEING AND QUALITY OF LIFE,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
T. A. Heberlein.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 89-100, 1 fig, 64 ref, 1 append.

Descriptors: Water resources, *Research and development, *Methodology, *Attitudes, Analytical techniques, Measurement, Evaluation, Decision making, *Planning, Testing procedures, Social aspects, Analysis.
Identifiers: *Likert scale, Study design, *Quality of life, Case studies, Experimentation, Guttman scale, Thurstone scale, Verification, *Social well-being, Path analysis, Validity.

Suggestions are made for improving methodology. (1) Study reliability must be estimated, for if reliability is low the observed impacts of variables may be attenuated leading to incorrect estimates. Self-report attitude scales like the Thurstone, Guttman and Likert scales are not equally reliable. Factor analysis can be used to test validity. (2) Study design is important. Field experiments can be useful because of the amount of information yielded, but their cost may have to be justified to administrators. (3) Prospective analysis should be looked at early in order to get the most out of collected data. Much information goes unused. Use of correlation and regression is encouraged because of their power to indicate relationships. Path analysis, which is a combining of a set of regression equations into an integrated and systematic form, can be useful to give a pictoral representation of relationships, and path regression coefficients are directly related to policy. An appendix gives an example of estimating reliability. (See also W76-0354) (Smith-North-Carolina)
W76-05362

TOWARD A QUANTITATIVE MEASURE OF THE QUALITY OF LIFE,
Michigan State Univ., East Lansing. Dept. of Sociology.
K. E. Hornback, and R. W. Shaw, Jr.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development, Proceedings: Conference of University Council on Water Resources, July 10-121 1973, Utah State Univ., Logan. p 101-116, 2 fig, 26 ref, 1 append.

Descriptors: *Evaluation, *Social impact, Analytical techniques, *Indicators, *Measurement, Social aspects, Decision making, Planning.
Identifiers: *Quality of Life, Objective measures, Subjective measures.

Quality of life (Q0L) is not a simple linear function that can be measured by any one measure. Q0L is viewed as being a function of the objective conditions appropriate to a selected population and the subjective attitude toward those conditions held by persons. The proposed quantitative scheme rests on assignment of objective and subjective values to Q0L factors from a factor list which is comprehensive, non-redundant, applicable to objective and subjective conditions, and uni-dimensional. An index must be built from parameters which can measure efficiently important states of the system. Indicators with a high correlation with Q0L are particularly important. Indicators must be applicable to a large population, should not be dysfunctional, should be reliable and repeatable, and based on data collected for the purpose. Objective measures are to be transformed to a 1 to 10 scale. For each individual the correlation between these measures is obtained and the factors are weighted. These parameters are combined into a reasonable expression for the factor index which describes the state of the factor and its importance. Ten population characteristics are to be collected for each individual including location, education, age, etc., so that objective and subjective measures can be arrayed against these characteristics to evaluate QOL for particular subsets. A time series analysis will be possible which has implications for government policy. There is an indication that aggregation of QOL obscures individual variation and therefore is of less use. Proposed methods have implications for determination of QOL changes, planning allocation of resources and policy evaluation. (See also W76-05354) (Smith-North Carolina)
W76-05363

HYDROLOGIC SEMANTICS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W76-05414

AN ANALYSIS OF WATER RESOURCE BENEFIT DETERMINATION METHODS WITH SPECIAL REFERENCE TO THE COSUMNES RIVER DIVISION PROJECT,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-05441

COST ALLOCATION FOR A REGIONAL POLLUTION TREATMENT SYSTEM,
Florida Univ., Gainesville, Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-05442

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
For primary bibliographic entry see Field 4A.
W76-05519

6B. Evaluation Process

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, USER'S GUIDE.
Harza Engineering Co., Chicago, Ill.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 326, $6.00 in paper copy, $2.25 in microfiche. October 1975. 140 p, 15 fig, 13 tab, 11 ref, append. For model on magnetic tape see PB-251 327. OWRT C-7229(No. 6200)(1).

Descriptors: *Economic impacts, *Fiscal constraints, *Projects, *Computer programs, Construction, Budget, Benefits, Costs, Present worth, Kentucky, Interest rates, Data collections, *Model studies, California, *Computer models.
Identifiers: *Construction stretch-outs, User guidelines, Data collection forms, Cave Run Lake Project(Ky), Auburn-Folsom South Unit(Calif).

The primary objective was to develop a tool for use by high level policy and budgetary decision-makers in the Office of Management and Budget, Department of the Interior, and Department of the Army in determining the economic impacts of fiscal constraints on water project construction. A computerized model was developed and tested on the Cave Run Lake Project, Kentucky, and the Auburn-Folsom South Unit, California. On the basis of the test results, it was concluded the model yields satisfactory estimates of benefit losses and changes in economic costs associated with construction stretch-outs and delays resulting from fiscal constraints. The model performs an economic analysis of a given project with and without fiscal constraints. The without situation corresponds to full funding of the construction program. The with situation corresponds to a reduced level of funding either in the budget year under review or in subsequent years. The model measures the changes in benefits, construction costs, related non-project costs, operation and maintenance costs, and flood damage risk associated with these alternative funding scenarios. The present worth of the net benefits and costs are computed for a range of interest rates to test the sensitivity of economic impacts to changes in the interest rate. A brief description of the main program and the subroutine is included in the technical appendix to the report. Whenever flow charts are needed they are included. A general flow chart of the main program is included. A computer program listing is included in the part of the appendix.(See also W76-05002)
W76-05001

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, (CARD DECK).
Harza Engineering Co., Chicago, Ill.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-251 327 $200.00/year domestic, $250.00/year foreign. October 1975. (1,121 punched cards.) Available in Mag. Tape: PB-251 327. Specify recording mode when ordering. OWRT C-7229(No. 6200)(1).

Descriptors: *Economic impacts, *Fiscal constraints, *Projects, *Computer programs, Construction, Budget, Benefits, Costs, Present worth, Kentucky, Interest rates, Data collections, *Model studies, California, *Computer models.
Identifiers: *Construction stretch-outs, User guidelines, Data collection forms, Cave Run Lake Project(Ky), Auburn-Folsom South Unit(Calif).

The program is written in Fortran IV language and it is a self-sufficient program, i.e., it does not need any auxillary storage. The main program reads the basic data pertaining to the overall project and executes the model by calling the different subroutines in the appropriate order. (See also W76-05001)
W76-05002

STOCHASTIC PROJECTIONS FOR WATER RESOURCES PLANNING,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W76-05012

RAIN DANCE DOESN'T WORK HERE ANYMORE, OR WATER USE AND CITIZEN ATTITUDES TOWARDS WATER USE IN ALBUQUERQUE, NEW MEXICO,
New Mexico Univ., Albuquerque. Div. of Governmental Research.
P. A. Lupsha, D. P. Schlegel, and R. U. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 133, $4.50 in paper copy, $2.25 in microfiche. Publication No. 84, December 1975. 50 p, 5 fig, 43 tab, 23 ref, append. OWRT B-040-NMEX(1).

Descriptors: *Urban sociology, *Attitudes, *Water consumption, Economics, *Water values, *Water rates, Domestic water, Water policy, Water conservation, *Water utilization, Water control, Cities, Utilities, Zoning, City planning, *New Mexico, *Water demand.
Identifiers: Water use patterns, Water using appliances, Vegetable gardens, Desert landscaping, Albuquerque(N Mex).

345 respondents in single family residencies were interviewed, and their attitudes towards water use compared with data from the computerized records of the city of Albuquerque on their actual water consumption. This comparative use data then formed the basis for attempting to discover what were the major factors in residential use in Albuquerque. Economic variables such as income, house value and lot size were the key factors in high water demand. The number of persons in the household proved to be the only significant sociological variable in creating high demand. The cultural variable of ethnicity appeared to have an impact on use, even when controlled for income. Landscape type and sprinkling system have significant impact on water demand. The city has a number of policy alternatives toward water use and water charges. In developing these policy alternatives, one must be aware of the interdependencies and the tradeoffs involved. A number of variables have an impact on demand. These variables should be amendable to a programmed scenario of pricing, conservation education and legal or zoning changes which could all be used to significantly lower water use and demand in the city. (Hain-New Mexico State)
W76-05016

ENVIRONMENTAL PROTECTION IN CALIFORNIA: COURT ACTION POWERS OF STATE AND LOCAL GOVERNMENT ATTORNEYS,
For primary bibliographic entry see Field 6G.
W76-05189

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT,
Coastal Zone Management Inst., Sandwich, Mass.
J. Armstrong, H. Bissell, R. Davenport, J. Goodman, and M. Hershman.
Nov., 1974. 231 p, 13 fig, 5 tab, 380 ref, 3 append.

Descriptors: *Coasts, *Comprehensive planning, *Estuaries, *Water resources development, *State governments, Management, Regulation, Planning, Area redevelopment, Water management(Applied), Shore protection, Water policy, Public benefits, Public lands, Boundaries, Boundary disputes, Ecosystems, Ecology, Federal government, Jurisdiction, Water utilization, Priorities, Coordination, Projects, Administrative agencies, Water utilization.
Identifiers: *Coastal Zone Management Act of 1972, Public hearings.

The Coastal Zone Management Act of 1972 w enacted to encourage the coastal states to devel comprehensive coastal resources manageme programs which in turn would provide wise and fective management of the nation's coastal ar This document presents an in-depth discussion the various elements of the Act and attend regulations that the states must consider developing their own program. It is broken do into five categories: (1) substantive elements; authority and organization; (3) organization use of information; (4) public participation; and estuarine sanctuaries. Substantive eleme covered include boundary determination, missible uses, geographic areas of particular c cern, and priority of uses. The authority sect considers the means of exerting control, organ tional structures, and problems involved in de ning organization capabilities. The informa section includes a consideration of the types o formation needed, and the use and sources of isting information. A discussion of the potentia public hearings as a tool for the generation of ideas is presented in the public participation tion. The estuarine section discusses nat ecological units, estuarine sanctuary uses, and relationship of shorelands to overall coastal z management. (Hoffman-Florida)
W76-05204

WATER AS A FACTOR IN ENER RESOURCES DEVELOPMENT,
Utah Center for Water Resources Resea Logan.
A. B. Bishop, M. D. Chambers, W. O. Mace, a D. W. Mills.
Available from the National Technical Info tion Service, Springfield, Va 22161, as PB-250 $5.50 in paper copy, $2.25 in microfiche. Water Research Laboratory Publica PRJER028-1, June 1975. 104 p, 42 fig, 39 tab ref. OWRT A-028-UTAH(1), 14-31-0001-5045.

Descriptors: Energy, Resources allocation, Li programming, *Optimization, *Energy co sion, Water consumption, *Utah, *Water al tion(Policy), Colorado River Basin, Model stu
Identifiers: *Colorado River Basin(U *Energy resources development.

Water is a key input to western energy reso development. Particularly where water sup are short and water quality degradation is a cr consideration, the water resource system con associated with energy development at altern sites need to be carefully examined. To de strate the model structure and capabilities, a plication is made to the energy resource r within the Utah portion of the Colorado Basin. Surface water resources availabl stream reaches are designated, and the po energy developments requiring water input both extraction and conversion processes located. For the initial application of the m optimal solutions were obtained for both e maximization and water minimization which trate composite system effects and potentia flicts that could arise from various combina of water allocation to energy resources de ments.
W76-05250

FIELD-LEVEL PLANNING FOR AREA WASTE TREATMENT MANAGEMENT MODEL FOR PLANNING UNDER SECTIO OF THE FEDERAL WATER POLLUTION TROL ACT,
North Carolina Univ., Chapel Hill. Dept. o and Regional Planning.
For primary bibliographic entry see Field 5D.
W76-05261

SCREENING MODEL FOR CONJUNCTIV WATER SYSTEMS,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 4A.

W76-05268

MANUAL FOR TRAINING IN THE APPLICATION OF THE PRINCIPLES AND STANDARDS OF THE WATER RESOURCES COUNCIL.
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 9B.
W76-05348

THE ECONOMIC VALUE OF WATER FOR SELECTED USES IN SOUTHWESTERN NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
G. C. Griffin.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 885 $5.00 in paper copy, $2.25 in microfiche. Completion Report No. WI-221-034-76, February 1976, Part I, 73 p 1 fig, 59 tab, OWRT-A-041-NDAK(2) 14-31-0001-403, 5034.

Descriptors: *North Dakota, Evaluation, *Water utilization, *Economics, Electric power, Irrigation, Municipal water, Recreation, Alternative costs, Water supply, Water demand.
Identifiers: Southwestern, North Dakota.

Because of the lack of an active free market system for water, it is necessary to establish the economic value of water using economic analysis. Several approaches were reviewed before selecting those methods which were most appropriate for determining the value of water for different uses. The 'residual imputation' approach was employed for determining the value of water used in steam electric power, synthetic gas and irrigation. The 'alternative cost' method was used for determining municipal water supply values. Values of water were determined for the selected uses of industry (steam electric power generation and synthetic gas production), agriculture (irrigation), municipal water supply and recreation. Water used for steam electric power was valued at a range of $308.97 to $145.47 per acre-foot. Synthetic gas produced from coal yielded a water value of $306.45 per acre-foot. The value of water used for irrigation varied from $17.06 to $94.62 per acre-foot depending on the price level used in the analysis. The value of municipal water was placed at 58 cents/1000 gallons. Water value for recreation was based on user days which varied from $0.75 to $2.75 per user day. (See also W76-05351 and W76-05352).
W76-05350

DEVELOPMENT PRIORITIES IN THE WEST RIVER REGION, NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
E. Bowes.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250886, $5.75 in paper copy, $2.25 in microfiche. A-041-NDAK (4) 14-31-0001-5034, 4034 Completion Report, No. WI-221-034-76, Feb. 1976. Part III, 146 p, 44 fig, 26 tab, append.

Descriptors: *Social aspects, *Water resources development, Planning, *Area redevelopment, North Dakota, *Attitudes, Community development, *Rural sociology, Priorities, Communication, Water management(Applied), Water pollution, Agriculture.
Identifiers: West River Diversion(N Dak), Coal development.

Social attitudes and degree of communication concerning development priorities in West River Region of North Dakota were analyzed using written surveys. There was limited awareness of the West River Diversion Project. Among those aware, problems identified included aspects of coal development, water management, pollution and agriculture. Federal agencies were more frequently criticized than state agencies as being unresponsive to local needs, but there was good correlation between problems identified by agencies and the general public. Information from agencies tended to diffuse indirectly and there was minimal communication among citizens with similar concerns. A series of suggestions are made to change the situation. (See also W76-05350 and W76-05351)
W76-05352

HOUSEHOLD WATER USE,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05353

THE SOCIAL WELL-BEING AND QUALITY OF LIFE DIMENSION IN WATER RESOURCES PLANNING AND DEVELOPMENT.
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250966, $7.75 in paper copy, $2.25 in microfiche. OWRT XX-125 (No. 3752) (1) Proceeding of the Conference of the University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. 213 p. Andrews, W. H. , Burdge, R. J., Capener, H. R., Warner, W. K., Wilkinson, K. P.
Identifiers: *Social Well-Being, *Quality of Life Measurement, Social indicators(masurement).

These proceedings represent the final report from a conference which was directed toward problems of analysis and measurement of social well-being and quality of life with a focuus on water resources. Papers by academicians, deal with conceptualization, measurement and research results, response papers from representatives of government and private organizations. Sections of the report cover the background of development of social well-being as a relevant value in planning and evaluation of water resources; problems in the political process in adopting social indicators and problems of organizing for needed research of a national character with thinly scattered personnel; methodology and some results in research relating to social goals; quality of life and water resources; an overview of theoretical and conceptual issues; and finally a synthesis of these elements concerning possibilities and conditions related to dealing with social well-being as a functional account in planning and evaluating water resources development. (See W76-05355 thru W76-05370) (Andrews-Utah State).
W76-05354

THE GENESIS AND FUNCTION OF THE FOURTH WATER RESOURCES COUNCIL ACCOUNT,
Office of the Chief of Engineers (Army), Washington D. C. Civil Works Directorate.
W. J. Donovan.
The Social Well-being and Quality Life Dimension in Water Resources Planning and Development, Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 11-27, 1 fig, 28 ref.

Descriptors: *Welfare(Economics), *Social aspects, *Social function, *Environmental effects, Water resources, *Planning, Cost-benefit analysis, Indirect benefits, Direct benefits, Social impact, Population, *US Water Resources Council.
Identifiers: *Social welfare function, Bergson function, Social well-being, 'Fourth Account' objectives, National Environmental Policy Act of 1969, River and Harbor and Flood Control Act of 1970, Public participation, Community growth, Community cohesion.

Today water resource planners must consider many more objectives and potential impacts than formerly because of increased public concern for social and environmental effects and increased public participation. Government laws, such as the National Environmental Policy Act of 1969, Sections 122 and 209 of the River and Harbor and Flood Control Act (RH & FC Act) of 1970 and the Principles and Standards of the Water Resources Council, have also affected planners' efforts. In response to this broadening of objectives, to include the 'fourth account' which is defined to include the social well-being and quality of life dimension, evaluating procedures have also broadened. Evaluation must view economic, social and environmental effects. Multidisciplinary skills are called for and the traditional economic framework is no longer adequate. There is a need for a social welfare function in the Bergson tradition which encompasses the full range of society's economic and non-economic preferences, but this cannot be constructed at present. Best alternative is an open planning process which seeks the fullest public involvement as the RH & FC Act mandates the Corps of Engineers to do. There must be attention to non-monetary considerations and a balance of beneficial and adverse project effects, both direct and indirect. Social effects that can result from a proposed project are: income distribution, population density and mobility, displacement of people, desirable community growth, public health, community cohesion, certain cultural and recreation alternatives, and environmental effects. (See also W76-05354) (Smith - North Carolina)
W76-05355

GOVERNMENT AGENCY EFFORTS IN QUALITY OF LIFE IMPACTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
D. J. Allee.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 28-38, 12 ref.

Descriptors: *Cost-benefit analysis, *Economics, Water resources, *Planning, *Social aspects, Evaluation, *Income distribution, Federal government, Environmental effects, Welfare(Economics), U S Water Resources Council.
Identifiers: *Social well-being, *Public participation, *Multiple objective evaluation, Citizen participation, Government agency.

In public water resource investment the local identity of projects has been taken into account in decision making. Formerly, technical feasibility, cost-benefit analysis, and sustained local support have been tests to accept or reject projects. Today environmentalists have struck a blow at local support, and given a choice of other federal assistance projects; water development does not always get first priority from citizens. Multiple objective evaluation may possibly loosen old procedures and ways of handling information. A new version of multiple objective evaluation published in the Federal Register in December 1971 downgrades the concept of social well-being from an objective against which to formulate projects to an evaluation account which includes the following factors: income redistribution, health and safety, emergency preparedness, and other relevant social effects. Issuance of the Water Resources Council Principles (the Blue Book) spurred efforts at planning toward and evaluating social well-being factors. Now economics is the dominant framework for analysis. Economists tend to be the key evaluators of efficiency and distribution. In testing 19 programs only one team of evaluators attempted to formulate a new plan or project against the social well-being objective. Functional program output was seen as justification for the project by most test teams. Income redistribution can be handled quantitatively by identifying benefit incidence by affected groups and by income classes within groups and through evaluating cost incidence which should be a blend of negative project effects

and tax and payment distribution. A simple test is whether or not there is a net progressive effect of the project. (See also W76-05354) (Smith-North Carolina)
W76-05356

THE ROLE OF SOCIAL SCIENTISTS IN THE DETERMINATION OF THE SOCIAL WELL-BEING AND QUALITY OF LIFE DIMENSION IN WATER RESOURCES,
League of Women Voters, Washington, D.C.
R. C. Clusen.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 39-43.

Descriptors: *Social aspects, Water resources, *Planning, *Environmental effects, Evaluation, *Alternative planning, *Research priorities, Technology, Planning, Decision making, Social impact.
Identifiers: *Social well-being, *Public participation.

A primary role of social scientists should be in closing the gap between science and technology, and social, legal and political customs. Research into the social well-being dimension of water management should center on the criteria to be used for evaluating alternatives; the evaluation of needs, both economic and humanistic; the determination of public goals; and the manner in which the public can let choices be known. Planning must go beyond technical aspects as the value of more growth following old patterns is being questioned. There will continue to be increased public interest in changing the way the economy grows and the use made of that growth. The value of projects which overtly try to thwart natural processes is no longer clear. For example, instead of building a flood control reservoir it may be better to have adequate flood plain zoning. The taxpayer has no direct way through the political process of making his rational choices known. Citizens find it very difficult to weigh social and economic factors in water management. Collaboration between natural scientists, engineers and social scientists can provide a new kind of assessment of water management institutions. Determinations ought to be made as to just what is participation of the general public in planning and development. Projects and policies must be in harmony with the demands of the whole natural system, including the needs of people as individuals and as a group. (See also W76-05354) (Smith-North Carolina)
W76-05357

SOCIAL SCIENCE RESEARCH ON WATER RESOURCE ISSUES: PROBLEMS OF ORGANIZATION, ADMINISTRATION AND MANAGEMENT,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Rural Sociology.
H. R. Capener.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 46-52, 10 ref.

Descriptors: Water resources, *Planning, *Research priorities, *Social aspects, *Social values, Evaluation, Decision making, Grants.
Identifiers: *Quality of life, *Social science, Social well-being, 'Fourth Account' objectives, Research proposals.

Research on the social and quality of life dimensions of water resources cannot be done through today's independent small scale projects, but larger issues must be addressed in a more holistic sense so that isolated understandings can be put together. Today there is a paucity of funding for social research in water resources, paralleling the case of agricultural research where some 96% of funds in 1966 went to technological research and less than 5% went to social science research. This system is locked in to present approaches because of the training of administrators and scientists, because few social scientists have been involved in analysis, and because natural phenomena are easier to understand. Trying to change this system will involve structural organization changes which will be resisted by individuals and by established functional patterns of research. Items that demand research attention are: the meaning of the quality of life; methodologies to be employed; and the kind of individual and organizational changes that are needed for research to be oriented toward measuring quality of life components. Specifically, the following are needed: recruitment of social scientists to undertake research; organization of working conferences; facilitating grants from water resource agencies which could lay the foundation for progress in the early stages of research. Stages in the development of multidisciplinary research are: (1) problem exploration supported by funds for travel and working conferences; (2) completion of a project proposal to be submitted to peer review and administrative approval; (3) collection of data leading to a published document. (See also W76-05354) (Smith-North Carolina)
W76-05358

THE POLITICS OF INFORMATION: THE SOCIAL WELL-BEING OBJECTIVE,
Arizona Univ., Tucson. Dept. of Government.
H. Ingram.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources. July 10-12, 1973, Utah State University, Logan. p 53-58, 12 ref.

Descriptors: Water resources, *Planning, *Social aspects, *Evaluation, *Social values, Decision-making, Cost-benefit analysis, U S Water Resources Council.
Identifiers: *Social indicators, *Social well-being, Information cost, Public participation.

While social indicators may be justified in terms of national goals or utility to social scientists, indicators will be used when their utility to policy-makers is greater than the cost of using them. Dollar costs or opportunity costs can be expensive unless such information is routinely collected and kept up to date. The costs of consuming the information can also be high if it is not well-ordered and concise. Also, there is a 'cost' involved in the use of information if it conflicts with the policy-makers own self-image or the image of the agency for which he works. Social indicators are foreign territory for agencies like the Office of Management and Budget which are thoroughly versed in cost-benefit analysis, and therefore likely to use these indicators. The utility of new information is important. Indicators can be used to justify actions which an agency is already determined to take or in some cases to make a project look respectable even though on economic grounds alone it may not be justifiable. A recent increase of 1 5/8% in the discount rate used by government means that some marginal projects are no longer supportable using economic criteria alone so that social evaluation may lead to a justification of these projects. Another value of social indicators is to provide support for projects in the face of increasing criticism from citizens of the social and environmental impacts of projects. (See also W76-05354) (Smith-North Carolina)
W76-05359

SOCIAL IMPACTS AND METHODOLOGICAL PERSPECTIVES FROM A POST AUDIT ANALYSIS OF WATER RESOURCE DEVELOPMENT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
W. H. Andrews, and G. E. Madsen.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 61-74, 2 fig, 8 tab, 15 ref. OWRT C-2192(No. 3408)(2).

Descriptors: *Direct benefits, *Indirect benefits, Water resources, *Planning, *Social impact, *Recreation demand, *Water demand, Projections, Reservoirs, Irrigation, Water supply, Cost-benefit analysis, Social aspects, Social values, Fishing, *Utah.
Identifiers: Weber Basin(UT), Pineview(UT), Willard Bay(UT), Ogden(UT), Rockport(UT), Lost Creek(UT), East Canyon(UT).

Research presented attempted to measure social impacts of a water reclamation project in Weber Basin which includes Ogden, Utah and surrounding areas. The reservoir project has potential impacts on welfare interest including the social values that motivate choices of behavior, aesthetic interest, and diversion-entertainment interests. Several methods were used to identify social impacts. In the 1949-59 planning period estimates of total project water supply changed from 285,000 to 212,000 acre-feet and overall estimates of irrigation requirements were lowered. The projected recreation cost allocations dropped from $4.6 million to $3.7 million but over the whole time period the benefit-cost ratio was always far greater than 1.0 for recreation. Actual consumption figures after the project was built were compared with planning projections. The 1972 irrigation water sales were 55% of the 1959 projection of available irrigation water; municipal water sales for 1972 were 78% of the 1959 estimate. In recreation use, 4 of the 5 reservoirs had more recreation visitor days of use than projected. In a projected random sample of urban dwellers there was a perceived increase in participation in all recreation activities associated with the use of reservoirs except for swimming which did not change significantly. Almost 80% of the respondents felt that a lack of water-related activities would detract from enjoyment of their life. In the future there may be a conflict between uses if increased selling of water results in a drawdown of reservoir water to levels unacceptable for recreation use. (See also W76-05354) (Smith-North Carolina)
W76-05360

A SUMMARY OF SOCIOLOGICAL STUDIES OF WATER RESOURCES DEALING WITH SOCIAL GOALS AND THE QUALITY OF LIFE: 'THE STRAWMAN' AND OTHER STUDIES,
Kentucky Agricultural Experiment Station, Lexington.
R. V. Burdge.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 75-88, 94 ref.

Descriptors: Water resources, Planning Social aspects, *Social impacts, Evaluation, *Income distribution, Decision making, Research priorities, Recreation.
Identifiers: *Social well-being, *Quality of life, *Strawman report.

Existing theories and methodologies must be used to understand the quality of life dimension of water resources development. Of the important social goals only 1/3 can be captured by economic indicators. Factors in the social well-being dimension are described. Studies of the TVA should indicate how goals can be kept from being distorted bureaucratization. Studies on attitudes show that the quality of life is enhanced where people perceive personal benefits. Middle class people are more likely to see recreational benefits than groups such as farmers and rural inhabitants. People who favor change are younger, better edu-

cated, have higher incomes and hold modern values, while those who oppose are long-term residents, land owners, farmers and rural people. Relocation and resettlement costs tend to be higher for larger families, older persons, long term residents, and those without knowledge of legal apparatus who often accepted settlement below fair market value of their property. Research is needed on how forced migrants might be treated to improve their quality of life. Willingness to participate in water projects is based on need, community awareness, knowledge, expectations of personal benefits, and higher socioeconomic status. Water based recreation enhances the quality of life mostly for young lirbam families. The Strawman report proposes primary goals, subgoals and social indicators to be used with undefined connectors' in determining how one course of action affects these goals and subgoals. The report was criticized as being too aggregate and untested. (See also W76-05354) (Smith-North Carolina)
W76-05361

METHODOLOGICAL STRATEGIES FOR EVALUATING THE EFFECT OF WATER RESOURCES ON SOCIAL WELL-BEING AND QUALITY OF LIFE,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
For primary bibliographic entry see Field 6A.
W76-05362

TOWARD A QUANTITATIVE MEASURE OF THE QUALITY OF LIFE,
Michigan State Univ., East Lansing. Dept. of Sociology.
For primary bibliographic entry see Field 6A.
W76-05363

THE RELATIONSHIP BETWEEN SOCIAL PSYCHOLOGICAL SYSTEMS AND WATER RESOURCES DEVELOPMENT: A SUMMARY,
Abt Associates, Inc., Cambridge, Mass.
J. J. Fitzsimmons, and O. Salama.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973. Utah State University, Logan. p 117-158, 6 tab, 28 ref.

Descriptors: Water resources, *Social impact, Water resources development, *Social needs, Analytical techniques, Social aspects, Cost-benefit analysis, Evaluation, Environmental effects, Decision-making, Benefits, Costs, Planning, *Social values.
Identifiers: *Multiple-objective planning, *Quality of life, Group measures, Social psychological systems.

The aim of this study, built upon existing theories in the social sciences and water development, was to construct a statement of man's social need for water and the impact of water upon man, and to develop measures to assess alternative water development activities. Concepts from the social sciences which were relevant to water policy were put into 7 categories, including individual and group behaviors, social processes, and population, to form a hierarchy for further study of man/water relationships. Water development activities and functions were identified and grouped into 14 functional categories. A matrix was constructed to identify various interactions between man and water. Each of the 98 matrix cells was examined for parameters concerning man's needs for water and positive and negative benefits of water. For example, the cell at the intersection of the social category 'group' and the water function 'security' revealed parameters including perception of a threat from water origin to the group members, perception of such a threat to the group's goals, and so on. These parameters are not measures but provide insight. Measures should be capable of being aggregated to larger geographic areas, reflect concerns which can be compared to economic and environmental concerns, and reflect concern for equity and quality of life. In the context of multiple-objective planning the measures should provide useful information for decision-making, lead to an optimal choice, reflect concern for long-range planning, and build upon existing models. The next step should be data collection and development of a logic for ranking of alternative projects for an area, followed by field tests and specification of an aggregation model. (See also W76-05354) (Smith-North Carolina)
W76-05364

SOCIOLOGICAL CONCEPTS OF SOCIAL WELL-BEING: FRAMEWORKS FOR EVALUATION OF WATER RESOURCES PROJECTS,
Pennsylvania State Univ., University Park. Dept. of Rural Sociology.
K. P. Wilkinson.
In: The Social Well-Being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 160-170, 25 ref.

Descriptors: Water resources, *Planning, *Social aspects, *Evaluation, *Social change, *Research priorities, *Social needs, Environmental effects, Decision making.
Identifiers: Social theories, *Social well-being, Social conditions, Quality of life, Equilibrium theory, Field theory.

To undertake purposive social action a clear framework of projected end states or goals is needed. Three steps are discussed: (1) The concept of social well-being must be distinguished from a concept of individual well-being and one of universal, ecological well-being, as these are variants of the same reality. Individual well-being is necessary for social well-being but the individual's experiences are only indirectly affected by social planning. Collective action must create humane institutional structures within which the individual is free to experience his distinctive human and private capacities, and thus actualize the quality of life. Conditions which would facilitate a transition from a dominant concern with economic growth to a more balanced human oriented approach include distributive justice, openness of communication, tolerance, interpersonal communication and collective viability. (2) Theories of social change range from equilibrium theories which view social change as a sequence of steps toward an ever more adequate adjustment of man and society with universal principles of orderly, holistic arrangement, to field theories which emphasize novel, emergent aspects of life. Social well-being is amenable to analysis using either theory or other modern theories. With equilibrium theory actions would be judged on how they increase functional integration or balance among system levels. Field theory evaluates the degree to which goals of actors are effectively pursued within the general framework of the conception of individual, social and ecological needs. (3) Water resources research can help to establish a useful understanding of the change process. (See also W76-05354) (Smith-North Carolina)
W76-05365

SOME PROBLEMS IN MEASURING THE SOCIAL CONSEQUENCES OF LARGE-SCALE DEVELOPMENT PROJECTS,
Brigham Young Univ., Provo, Utah. Dept. of Sociology.
W. K. Warner.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 171-185, 1 fig, 19 ref.

Descriptors: Water resources, *Evaluation, *Social impact, Analysis, *Model studies, Indirect benefits, Direct benefits, Decision making, Methodology, *Planning.
Identifiers: *Research models, *Social well-being, Goal models, General effects model.

The degree to which social consequences of large-scale development projects can be measured depends on the purposes of the users of evaluations and on the perspectives of those who judge the quality of information. To be of use to policy makers, social scientists should work not only toward measurement of many variables, but also on creating packages of variables which have internal consistency and continuity. Which phenomena are to be measured is important. Three models are pertinent. (1) A Goal Model tries to evaluate the degree to which goals were successfully met by projects with the assumption that planning is goal-oriented, (an item which is questioned). This model may not have a broad enough scope to include all consequences. (2) The General Effects Model attempts to see if some segment of society has changed as a result of projects. It is questionable, however, if all relevant variables can be measured and identified. (3) A Combined Model is suggested and has 3 categories of dependent variables: (a) There must be a study of goals that were used in project planning and implementation since inclusion of some goals and not others implies the inclusion of some people as interested parties and not others; (b) The changes or effects represented by the attainment of the goals stated in the project design, including who benefits most and least, must be studied; and (3) Latent functions must be viewed to discover effects that were not anticipated. Several requirements must be met: an analysis of who benefits and who pays; adequate data base; adequate time span; accumulation and refinement of data and persuasive examples; and persuasive evidence supporting any attributions of cause. (See also W76-05354) (Smith-North Carolina)
W76-05366

SOME COMMENTS ON RURAL DEVELOPMENT MODELS AND CONCEPTS,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
G. F. Summers.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 186-188, 5 ref.

Descriptors: *Water resources development, *Social impacts, Evaluation, *Rural sociology, Social aspects, *Research priorities, Analysis.
Identifiers: Case studies, *Quality of life, *Social well-being, Distributional analysis, Industrial development.

The paper given by K.P. Wilkinson, 'Sociological Concepts of Social Well-being: Frameworks for Evaluation of Water Resources Projects' (see W76-05365) is criticized. It is ultimately individual well-being that is the concern; ecological, social, or economic well-being is of interest only because it is believed that those systems have a conditioning effect on individual well-being. Efforts to develop a scientific theory of quality of life are going to fail. However, there are possible roles for scientists in relation to rural developments: (1) As a facilitator, the scientist may identify efficient means for achieving stated goals; (2) As an evaluator he may assess the effectiveness of programs; (3) As a bookkeeper it is possible to collect data on relevant parameters; and (4) The scientist may define norms based on alternative policy goals and related means. Only when we separate domains of life, plant, animal, human and subclasses of each, can quality of life be confronted. Case studies are valuable but of limited utility because they assume that effects are localized. Effects are extended by

rural commuter fields. It is necessary to better define target populations with special attention given to the differentiated and pluralistic nature of people affected by development projects, and to narrowly focus studies. These should be viewed as field experiments rather than general systems monitoring projects. (See also W76-05354) (Smith-North Carolina)
W76-05367

SOCIAL WELL-BEING: PROBLEMS AND PROSPECTS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
C. L. Smith.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 190-198, 3 fig, 1 tab, 38 ref.

Descriptors: Water resources, *Planning, *Social impacts, *Evaluation, *Decision making, Income distribution, Environmental effects, Research priorities, Standards, Columbia River.
Identifiers: *Columbia River Basin, *Social well-being, Case studies, Water quality management.

A systematic analysis of social well-being is difficult because such analysis cannot be both logically consistent and complete. There are multiple accounts (national income, distribution, etc.) and only one can be maximized at any one time. It is possible to choose not to deal with social well-being because there exists major policy questions, because there is not necessarily a correlation between quality of life and happiness, and because of the massiveness of the necessary data and its interdependent nature. However, the task should be undertaken and should not be put off in hopes of a breakthrough in the field. More responsibility should be given to social scientists so that their research would have more impact. In planning for the Columbia Basin Project in 1941 many of the social well-being questions were asked but answers had little resemblance to the prepared planning documents. A plausible approach to social well-being which mixes available knowledge with trial and error is to follow the model of water quality management. Managers have not known all factors which go into water quality; they had to deal with a great number of waste dischargers, and were inadequately funded. However minimum standards were arrived at and the worst offenders were attacked first. A similar approach to social well-being is possible in that some minimum standards do exist in nutrition, education, health, and housing. The population could be measured against these standards, those below standards identified and action programs undertaken. However, where programs have been undertaken in these areas, results have been less than impressive. (See also W76-05354) (Smith-North Carolina)
W76-05368

SOCIAL SCIENTISTS AND THE QUALITY OF LIFE: A CRITICAL SYNTHESIS,
Michigan State Univ., East Lansing. Dept. of Sociology.
D. E. Morrison.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 199-203, 1 fig, 1 tab.

Descriptors: *Social impact, *Decision making, *Institutions, *Social needs, Water resources, Planning, Evaluation, Alternative planning, Research priorities, Social values, Social aspects.
Identifiers: *Social well-being, *Quality of life.

This paper deals with 3 problem areas. (1) The basic elements of the concept of the Quality of Life (QOL) must be the focus of study because of disagreement about more esoteric elements. In the United States, where QOL is quite high, there is no commitment to impose a definition of QOL on the public. This should be avoided because it would soon reach diminishing returns. In effect, freedom ranks above basic needs so that to provide for the general welfare must involve only the necessary, but not sufficient, conditions for freedom, allowing for mobility between quality levels. It does not follow that because basic needs are met a person is happy, as social institutions also have an impact. Efforts should be made to understand the relationship between institutions and basic individual needs. (2) Methodological problems in QOL research are difficult, but not insoluble. Water resources is the ultimate independent variable here and it is the effects on institutional arrangements which in turn affect aggregated individual needs which is important. Water resource decisions must be viewed in the regional and national context, but these resources are only one element among many resources which contribute to QOL. (3) The QOL issue is politically complex and balancing of various groups' needs is not easy. Needs of less articulate groups must be considered as their basic needs are important. The QOL issue should not be used merely to support existing programs or methods. (See also W76-05354) (Smith-North Carolina)
W76-05369

SOCIAL WELL-BEING AND QUALITY OF LIFE: SCIENCE, POLITICS OR MOVEMENT.
Missouri Univ., Columbia.
D. Hobbs.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 204-210, 9 ref.

Descriptors: *Social impact, *Decision making, *Evaluation, Social aspects, *Political aspects, Water resources, Planning, *Social participation.
Identifiers: Citizen participation, *Quality of life, *Social well-being, Social indicators, Sociologists.

Rather than assuming that society is an acceptable standard and that it can be improved by eliminating deviant behavior, concern about the system itself is increasing. Social well-being and quality of life (SWB/QL) is an important issue in which sociologists can take the option of identifying and measuring social indicators. A political definition of the problem is possible in which the process by which judgments are made and whose judgments are taken into account is viewed. Another option is to view SWB/QL as a social movement which challenges existing standards. Some assumptions shared by many at the conference are: SWB/QL is subjective and varies among individuals; water has multiple uses and is governed by many specialized agencies; the uses central to a given decision depend on particular groups which initiate actions and their relative power; and sociology can be useful in conceptualizing and measuring SWB/QL, and dealing with organization questions. Many of these concerns support the view that SWB/QL is a political problem and involves several types of political units: localities, users, indirectly affected potential users, politicians and agency personnel. Water resource planning and decision-making can benefit from increased participation by publics and interests covering a wide area of concern. The use of SWB/QL includes improved descriptive reporting, analysis of social change and prediction of future social events, but it is argued that the setting of goals, the evaluation of programs and the development of a balance sheet are impossible uses of social indicators. Finally, it is necessary that both technical and political problems of SWB/QL be studies. (See also W76-05354) (Smith-North Carolina)
W76-05370

PUBLIC PARTICIPATION IN WATER AND WASTE WATER PLANNING,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
B. C. Dysart, III.
Presented at the Southeastern Conference on Water Supply and Waste water in Coastal Areas, Wrightsville Beach, N. C. April 2-4 1975. 33 p, 21 ref.

Descriptors: *Planning, *Alternative planning, *Decision making, *Social aspects, *Public benefits, Coastal areas, *Governments, Project planning, Legislation, Water supply development.
Identifiers: *Public participation.

Public participation is necessary to have water supply and waste water systems responsive to public needs. This paper defines differing concepts, discusses their effectiveness and suggests some approaches applicable to water supply and wastewater treatment projects. The three components of a public participation program include a communication method, an interaction method for planner and public, and an iterative mechanism for experts and public to review recommendations after revisions have been made. Participation and authorization levels ranging from non-participation to citizen power are outlined. Public participants must understand the trade-offs, their environmental cause and effect relationships, and incurred costs. Planners' responsibilities include obtaining reactions to alternatives, assessing feedback from discussions and feasibility of alternatives, and determining reaction to final plan. Factors necessary in developing a public participation program include determination of interest groups participants, medium, form of output and the organization of the group. A review of public participation approaches and attitudes of governmen agencies was made. (Salzman - North Carolina)
W76-05371

A METHOD FOR APPLYING RESEARCH TO ENVIRONMENTAL PLANNING AND MANAGEMENT: A CASE STUDY OF ISSUES IMPORTANT TO THE CHESAPEAKE BAY REGION,
Center for the Environment and Man, Inc., Hartford, Conn.
R. H. Ellis, P. B. Cheney, and D. R. Zoellner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-227 719 $5.00 in paper copy, $2.25 in microfiche. Report No. NSF-RA-E-73-009, May 1973. 87 p, 7 fig, 1 tab, 54 ref. GI 35358.

Descriptors: *Regional development, *Planning, *Methodology, *Management, *Chesapeake Bay, Environment, Coasts, Decision making, Data collections, Research priorities.
Identifiers: *Research projects, Case study.

An eight step procedure is discussed for identifying key issues and problems as they relate to management functions and activities, and for identifying and selecting research projects to support the management functions related to the tidal limits of Chesapeake Bay region but applicable to other geographic areas. The steps are: (1) Identify uses of a region; (2) rank uses by importance of associated planning and management issues; (3) identify and classify types of problems; (4) rank and select important problems; (5) evaluate problems; (6) relate problems to management functions and activities; (7) relate research and information needs to management functions and problems, and, (8) establish research project priorities, sequence, and approaches. The types of problems specifically considered in the Chesapeake Bay region were recreational uses, commercial fishing, commercial marine transportation, shoreland use--industrial/commercial/residential development, mineral resources, waste disposal, wetlands for natural production, and water supply. The problems of meeting each specific need are classified on socio-economic

natural, technological, and institutional aspects, and their conflicting interrelated uses. (Auen-Wisconsin)
W76-05434

USER PREFERENCES OF POLICY ALTERNATIVES: THE CASE OF RECREATIONAL USER ATTITUDES TOWARD DEVELOPMENT AND REGULATION AT LAKE MONROE, INDIANA,
ndiana Univ., Bloomington. Poplars Research nd Conference Center.
C. Wise.
Occasional Papers No. 4, January 1975. 97 p, 27 ab, 7 ref, 3 append.

Descriptors: *Recreation, *Administrative decions, *Attitudes, *Surveys, *Regulation, Methodology, Law enforcement, Reservoirs, Indiana, Environment, Recreation facilities, Water quality.
dentifiers: *Lake Monroe(Ind).

Opinions of recreational users of Lake Monroe eservoir, Indiana, were surveyed concerning aditional development of various facilities, recreaonal activity regulations, environmental quality, nd their perception of the extent of enforcement f recreational regulations. Preferences toward adtional development varied widely. There was a ck of relationship between county of residence nd facilities preference, and between perception f environmental condition (water clarity, shore rosion, forest attractiveness, and litter) and facilies. Only banning of motorcycling received sigficant support. Bicycling, boat fishing, and sailg received majority support. Motor boating, mping, horseback riding, swimming, waterskig, and motorcycling received a plurality support certain areas. Since no substantial relationships ere found between recreational activity reference and opinion on recreational activity gulation, policy decisions made to restrict activies in certain areas will not meet opposition on rely recreational activity lines, but situational riables could alter this condition. County of redence and frequency of visits were not signifintly related to recreational restrictions. A subantial number of respondents thought that there ere problems with shoreline erosion, water clari-, and litter as related to environmental quality. e survey methodology was based on primary riables as related to preferred recreational acity, road development, regulation of activities d their enforcement, environmental quality, and equency of use. (Buchanan-Davidson--Wiscon-)
76-05435

IDE TO THE COSTING OF WATER FROM CLEAR DESALINATION PLANTS,
plied Research and Engineering Ltd., Durham ngland).
r primary bibliographic entry see Field 3A.
76-05436

STUDY OF HOW WATER QUALITY FACRS CAN BE INCORPORATED INTO WATER PPLY ANALYSIS.
st and Ernst, Washington, D.C.
primary bibliographic entry see Field 5G.
6-05440

ANALYSIS OF WATER RESOURCE NEFIT DETERMINATION METHODS WITH CIAL REFERENCE TO THE COSUMNES ER DIVISION PROJECT,
ifornia Univ., Davis. Dept. of Agricultural nomics.
. Tratz, G. W. Dean, and H. O. Carter.
ilable from the National Technical Informa- Service, Springfield Va 22161, $6.00 in paper y, $2.25 in microfiche. Interim report, 1973. 148 p 24 tab 115 ref 8 append 14-06-200-.

Descriptors: *Benefits, *Estimating, *Input-output analysis, *Water resources development, *Model studies, Cost-benefit analysis, Income, Multiple-purpose projects, Regional development, Employment, Regional economics, Water demand, Water supply, Project purpose, Measurement, *California.
Identifiers: *Cosumnes River Project(Calif), Multiplier effects.

A theoretical input-output model which allows measurement of the magnitude of net income and employment impacts of a multipurpose regional water resources development project is constructed. Advantages of the model over the current methods of determining benefits include: (a) providing a range of regional income benefits, (b) allowing estimates of the direct and indirect output and multiplier effects of an initial investment in water facilities and permanent income and employment effects, (c) accounting for direct project impacts in the Cosumnes service area as well as indirect impacts expected to occur in the surrounding 4-county region, (d) allowing multisectoral analysis of local economics, (e) offering a more equal treatment of each project purpose, and, (f) bringing the direct effects of each project purpose into the model. Disadvantages include the possibility of some double-counting of benefits and the difficulty of distinguishing between direct or indirect benefits. Basing benefits on the value or demand for water rather than its cost, tradeoffs among competing uses, and possible environmental costs, are briefly considered. The model projects a regional income-benefit to 4-county regional cost ratio ranging from 1.78 to 4.59 in the case of the Cosumnes River Division Project, indicating that the technique can demonstrate the regional economic feasibility of this type of development project. (Luedtke-Wisconsin)
W76-05441

WATER USE IN SELECTED COMMERCIAL AND INSTITUTIONAL ESTABLISHMENTS IN THE BALTIMORE METROPOLITAN AREA,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05452

MANAGEMENT OF WATER QUALITY THROUGH SELECTED INSTITUTIONS AND INSTRUMENTS,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05453

ECONOMICS OF URBAN WATER DEMAND: A CASE STUDY OF THE HONOLULU BOARD OF WATER SUPPLY,
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6D.
W76-05455

FLOOD PROOFING DECISIONS UNDER UNCERTAINTY,
Massachusetts Univ., Amherst Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6F.
W76-05456

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A STUDY OF ALTERNATIVE METHODS TO MODERNIZE WATER INSTITUTIONS AND ELIMINATE PROBLEMS OF MULTIPLE JURISDICTION AND CONFLICTING OBJECTIVES,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 6E.
W76-05015

A CONTINUOUS REVIEW INVENTORY MODEL FOR IRRIGATION WATER APPLICATION,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 3F.
W76-05019

BIG-METER TESTING PROGRAM BOOSTS WATER REVENUES.
Water and Sewage Works, Vol. 122, No. 12, p 36-37, December, 1975. 4 fig.

Descriptors: *Costs, *Water supply, *Industrial water, *Potable water, Chemical industry, Oil industry, Steel, Municipal water, Water consumption(Except connsumptive use), Water utilization, Treatment facilities, Economics, Measurement, *Instrumentation, *Testing, Indiana.
Identifiers: *Water meter testing, Revenue collection, East Chicago(INd).

When the East Chicago, Indiana, Water Department tested large water meters in the area, it was found that four out of seven meters were less than 75% accurate. Within the municipality, there are major plant facilities in steel mills, foundries, oil refineries, and chemical industries which use about 311 million gallons of potable water per month. In addition, the residential and commercial use of potable water is about 312 million gallons per month. By a spot check on the industrial large water meters it was determined that some meters were frozen while others were old and obsolete. In some cases a single register compound meter could be installed. Replcement of four meters led to a revenue increase of $16,000 per year. In addition to the revenue increase, the city has found a sharp decrease in the amount of unaccounted-for water usage. (Kramer-FIRL)
W76-05060

FINANCING AND MANAGEMENT OF THE PROPOSED SEWERAGE SCHEME FOR JAIPUR TOWN,
Jaipur Public Health Engineering Dept. (India). Planning Circle.
For primary bibliographic entry see Field 5D.
W76-05062

ECONOMIC CONSIDERATIONS FOR PLANNING SEWAGE SLUDGE DISPOSAL SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5E.
W76-05083

THE ECONOMICS OF CLEAN WATER - 1973.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05203

THE LARGE-SCALE REGIONAL PLANT HYPOTHESIS: DISCRIMINANT ANALYSIS,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05267

DECOLORIZE KRAFT BLEACH PLANT EFFLUENTS EFFECTIVELY WITH LOW-COST POLYMERIC ADSORPTION METHOD,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W76-05288

COST-EFFECTIVENESS ANALYSIS FOR WATER POLLUTION CONTROL,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.

W76-05324

SOCIAL IMPACTS AND METHODOLOGICAL PERSPECTIVES FROM A POST AUDIT ANALYSIS OF WATER RESOURCE DEVELOPMENT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W76-05360

GUIDE TO THE COSTING OF WATER FROM NUCLEAR DESALINATION PLANTS,
Applied Research and Engineering Ltd., Durham (England).
For primary bibliographic entry see Field 3A.
W76-05436

COST ALLOCATION FOR A REGIONAL POLLUTION TREATMENT SYSTEM,
Florida Univ., Gainesville, Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-05442

ECONOMICS OF EXHAUSTIBLE RESOURCES: THE FISHERY,
New South Wales Univ., Kensington (Australia).
G. Waugh, and P. Calvo.
Economic Record, Vol. 50, No. 131, p. 423-429, 1974. 2 fig, 14 ref.

Descriptors: *Marine fisheries, *Fish management, *Optimization, Economics, Fish harvest, Discount rates, Costs, Animal growth, Return(Monetary), Biomass, Mortality, Theoretical analysis, Resource allocation.
Identifiers: Beverton-Holt model.

An integrated approach to the problems of fisheries which combines the economic and biological variables relevant to the industry is developed. Prior economic studies have neglected the optimum time at which to exploit the fish during their life span and the interaction between catch and natural mortality. The Beverton and Holt concept of an optimum size at which fish should be caught has several economic objections; costs and revenues are not considered, future yields are not discounted to allow for the cost of waiting, and the biological approach is static in that it indicates that each fishery year-class should be exploited at one point of time during its life span. The integrated approach suggests that it is best to exploit each year-class over several periods. There is no optimum time at which the fish should be caught, but rather an optimal time path. The extent of exploitation will depend upon the social rate of time preference, the rate of growth of the year-class, and the prevailing demand and cost conditions in the industry. Regulation or management should aim at limiting, but not preventing, the catch from each age group through licensing. (Luedtke-Wisconsin)
W76-05443

FISHERY DYNAMICS: A NORTH ATLANTIC COD FISHERY,
Lund Univ. (Sweden).
R. Hannesson.
Canadian Journal of Economics, Vol. 8, No. 2, p. 151-173, 1975. 7 fig, 5 tab, 20 ref.

Descriptors: *Fish harvest, *Optimization, *Marine fisheries, Commercial fishing, Fish management, Fishing, Costs, Model studies, Economic efficiency.
Identifiers: Beverton-Holt model, Periodic fishing, Discounting, *Cod.

The optimal harvesting of a single fish group is discussed on the assumption that a unit of fishing effort removes a constant proportion of the fish stock. Discounting is shown to imply a longer fishing season. The relative merits of periodic and sustained fishing of a stock consisting of several groups are evaluated by simulating a Beverton-Holt model of a cod fishery. The impact of cost, discounting and natural fluctuations on the time-pattern of fishing is also discussed, as well as the practicability of periodic fishing. It is concluded that periodic fishing might be preferable for both small and large fisheries. A constant output might be achieved in the case of a large fishery by harvesting different stocks on a rotating basis. Periodic fishing could be practiced by a highly mobile fleet able to take maximum advantage of the natural fluctuations in stock size. A small fishery might find it advantageous to vary the fishing effort allocated to the cod fishery, depending on such things as the price of cod and the abundance of other fisheries. This periodic approach will allow the stock to replenish itself, thereby improving future prospects in that fishery. (Luedtke-Wisconsin)
W76-05445

INTERNATIONAL EXTERNALITIES AND OPTIMAL TAX STRUCTURES,
University of Western Ontario, London.
For primary bibliographic entry see Field 5G.
W76-05446

6D. Water Demand

RAIN DANCE DOESN'T WORK HERE ANYMORE, OR WATER USE AND CITIZEN ATTITUDES TOWARDS WATER USE IN ALBUQUERQUE, NEW MEXICO,
New Mexico Univ., Albuquerque. Div. of Governmental Research.
For primary bibliographic entry see Field 6B.
W76-05016

RURAL RESIDENTIAL WATER DEMAND IN KENTUCKY: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Water Resources Research Inst., Lexington.
O. C. Grunewald, C. T. Haan, D. L. Debertin, and D. I. Carey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 752, $5.00 in paper copy, $2.25 in microfiche. Research Report No. 88, December 1975. 75 p, 13 fig, 7 tab, 37 ref. OWRT A-052-KY(1), 14-31-0001-4017, 14-31-0001-5017.

Descriptors: *Water demand, Elasticity of demand, Water management(Applied), Model studies, *Kentucky, *Simulation analysis, Income, *Econometrics, Rural areas, Water supply, Prices, Reservoirs, *Pricing, Regression analysis, Water utilization, Model studies.
Identifiers: Residences, *Rural residential water demand.

This study proposed that demand management through pricing policies can be used in conjunction with supply management to solve water supply problems in Kentucky. Economic principles were shown to apply to rural residential water use. From the economic model, a hyperbolic demand function was theorized. The mathematical form of this function used quantity of water as a function of price, income, value of residence, evaporation, and persons per residence. This function was estimated using ordinary least squares regression. A log-linear model was found to be a satisfactory representation of the demand function. Price was the only independent variable which was significant and had an elasticity of (-.92). As an application of pricing to demand management, the estimated regression equation was used in a simulation analysis. The simulation was used to determine the reservoir capacity necessary to supply the needs of 4,000 households given three different price levels for water. Reservoir size was determined by simulating reservoir size as a function of outflow as estimated from the demand function plus an assumed low flow rate and inflow from the Thomas-Fiering Model. This technique illustrated that price does affect the quantity of water demand which in turn effects reservoir capacity requirements. (Huffsey-Kentucky)
W76-05252

THE ECONOMIC VALUE OF WATER FOR SELECTED USES IN SOUTHWESTERN NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05350

HOUSEHOLD WATER USE,
American Society of Civil Engineers, New York.
M. B. McPherson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250879, $5.50 in paper copy, $2.25 in microfiche. OWRT C-5045 (No. 4224) (5) American Society of Civil Engineers, Urban Water Resources Research Program, Technical Memorandum No. 28, January 1976. 110 p, 1 fig, 2 tab, 87 ref, Append.

Descriptors: *Water demand, *Domestic water, *On-site data collections, *Municipal wastes, *Water reuse, Water conservation, Regression analysis, Cost-benefit analysis, Forecasting, Public health, Seasonal, *Water utilization, Demand, Water policy, Water quality.
Identifiers: *Household water use, *Water use variations.

Primarily addressed to researchers, this report on household water use presents definitions of: the statusof information; changes in public policies and goals; and consequent needs for new information and research. Discussed are some of the most important quality quantity and economic considerations. Demand variations are given predominant attention, for individual and multiple households. Reuse considerations are highlighted. An appendix contains a listing of a unique set of water-use data for nine individual households covering a two-week period at a one-minute recording interval.
W76-05353

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS.
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05440

WATER USE IN SELECTED COMMERCIAL AND INSTITUTIONAL ESTABLISHMENTS OF THE BALTIMORE METROPOLITAN AREA,
American Society of Civil Engineers, New York.
J. B. Wolff, F. P. Linaweaver, Jr, and J. C. Geyer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 9[illegible], $4.50 in paper copy, $2.25 in microfiche. Urban Water Resources Research Program, Technical Memorandum No. 27, December, 1975. 67 p, 7 fig, 24 tab, 41 ref. OWRT C-5045(No. 4224)(4).

Descriptors: *Water demand, *Municipal water, *On-site data collections, *Design criteria, Forecasting, *Water utilization, Institutions, *Maryland, Cities, Industries.
Identifiers: *Commercial water use, *Baltimore(Md), *Institutional water use, Public water use.

Distributed originally in 1966, this report has been widely used as one of the few sources of field measurements of water demands of commercial and institutional establishments. Reissuance was predicated on the scarcity of original copies. In

ation reported can be useful in at least the design
new water demand research endeavors. The
ommercial Water Use Research Project spanned
period of 2-1/2-years, and was related to the
uch larger Residential Water Use Project. A sub-
ntial amount of new data was obtained in the
ltimore metropolitan area during the course of
e Project. Twenty-nine separate commercial and
stitutional installations were monitored; and new
sign criteria were developed for a total of nine
arate types of institutional establishments and
teen separate types of commercial establish-
nts. (McPherson-ASCE)
76-05452

**ONOMICS OF URBAN WATER DEMAND: A
SE STUDY OF THE HONOLULU BOARD OF
ATER SUPPLY,**
waii Univ., Honolulu. Dept. of Agricultural and
source Economics.
S. Oh.
ailable from the National Technical Informa-
n Service, Springfield, Va 22161 as PB-251 036,
75 in paper copy, $2.25 in microfiche. PhD thes-
December 1973. 160 p, 10 fig, 13 tab, 64 ref, 17
end. OWRT A-030-HI (2).

scriptors: *Hawaii, *Municipal water, *Water
nand, *Water supply, Water utilization, Water
ts, *Consumptive use, Water rates, Forecast-
Peak loads, Groundwater resources, Water
urces development, Industrial water, Prices,
itutional constraints, Lawns, Use rates,
ning, Water allocation(Policy), Water policy,
ression analysis, Hydrogeology.
ntifiers: *Honolulu(Hawaii), Per capita con-
ption.

er demand patterns and trends in Honolulu
e studied. From 1960-1971 average daily per
ta water consumption increased about 27%.
capita consumption figures varied widely and
ved different growth rates particularly in in-
sed summer usage. Consumption was greater
ngle than in multiple family dwellings, due to
e outdoor sprinkling. Consumption levels
ined essentially constant over time in
blished residential areas. Overall increases in
capita consumption resulted from water use
ther than indoor domestic purposes. Water
umption expanded with construction activity.
capita water consumption data were fitted by
r regression to value of construction
leted and annual rainfall changes; this equa-
explained 96% of total per capita consumption
tions. Residential and commercial water
were not responsive to price increases, but
industrial users were. There was a relation-
etween price responsiveness to industrial de-
and alternative water supplies. Nonex-
ce of price responsiveness in commercial de-
may be associated with the structure of
bill payments. The water requirement ap-
h is a practical method of forecasting future
needs. Peak load pricing may effectively
e inequitable water supply cost distribution.
ed groundwater resource management is sug-
l. (Buchanan-Davidson--Wisconsin)
05455

Water Law and Institutions

**IBILITY OF REGIONAL UTILITIES FOR
AGEMENT OF INDUSTRIAL AND MU-
PAL WASTES,**
gan Dept. of Commerce, Lansing. Office of
mic Expansion.
imary bibliographic entry see Field 5G.
5003

**UDY OF ALTERNATIVE METHODS TO
RNIZE WATER INSTITUTIONS AND
NATE PROBLEMS OF MULTIPLE JU-
RISDICTION AND CONFLICTING OBJEC-
TIVES,**
Utah State Univ., Logan. Coll. of Engineering.
F. W. Haws.
Available from the National Technical Informa-
tion Service, Springfield, Va 22161 as PB-250 116,
$4.50 in paper copy, $2.25 in microfiche. Utah
Water Research Laboratory Publication
PRWG122-1, September 1975. 51 p, 8 ref, append.
OWRT B-082-UTAH(1). 14-31-0001-3943.

Descriptors: *Institutions, *Institutional con-
straints, Organizations, Governments, Cities, Ir-
rigation districts, Water districts, Water policy,
Utilities, *Utah, Jurisdiction, State governments,
Income, Profit, Taxes, Alternative costs.
Identifiers: Water conservancy districts, Mutual
irrigation companies.

The water organizations in the State of Utah are non-businesses; most are governmental in nature, receiving revenues from taxes and expending their funds from a budget allocated out of such revenue. These organizations are, following the pattern of similar organizations, non-creative, non-innovative and in many cases are inefficient and ineffective in meeting optimum social needs. To alleviate this situation action should be taken to: (1) Amend the Utah Constitution by repealing Section 6 Article XI to allow municipalities the same option as other water users, to dispose of through sale or lease its water rights and associated physical works. This does not release a municipality from the responsibility to protect its citizens from fire danger or to provide its citizens with drinking water. (2) Repeal the Water Conservancy District Act, Chapter 9 Section 73 Utah Code Annotated 1953. The alliance that exists between the water conservancy districts and the Bureau of Reclamation is diverting public resources into expensive and unnecessary projects and leading to complete domination and control of water resources by the federal government. (3) The water conservancy districts should be disincorporated by devising some method of disposing of the repayment contracts with the federal government. (4) Reestablish the water privilege concept and eliminate water rights. (5) Remove water utilities from control of the Public Service Commission. (6) Allow and encourage the formation of free market controlled water utilities.
W76-05015

A GUIDE TO THE INTERSTATE CARRIER WATER SUPPLY CERTIFICATION PROGRAM.
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
For primary bibliographic entry see Field 5G.
W76-05040

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland). Control of Environmental Pollution and Hazards.
For primary bibliographic entry see Field 5G.
W76-05061

USE OF ENVIRONMENTAL ANALYSES ON WASTEWATER FACILITIES BY LOCAL GOVERNMENT,
Teknekron, Inc., Washington, D.C. Applied Research Div.
For primary bibliographic entry see Field 5D.
W76-05072

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W76-05073

MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS, REFERENCES, REGULATIONS, GUIDANCE, PROCEDURES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W76-05075

A LIVESTOCKMAN'S GUIDE TO POLLUTION LAWS,
For primary bibliographic entry see Field 5G.
W76-05171

LEGAL IMPLICATIONS OF FEEDLOT POLLUTION IN NEBRASKA,
Nebraska Univ., Lincoln. Coll. of Agriculture and Home Economics.
For primary bibliographic entry see Field 5G.
W76-05173

POLLUTION -- SHIPOWNERS' LIABILITY NOT LIMITED BY LIMITATION OF LIABILITY ACT. THE OCEAN EAGLE, 1974 AMC 1629 (DPR 1974) (DICTUM),
For primary bibliographic entry see Field 5G.
W76-05184

PROTECTING PUBLIC HEALTH FROM HAZARDOUS SUBSTANCES: FEDERAL REGULATION OF ENVIRONMENTAL CONTAMINANTS,
Environmental Law Inst. Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-05185

COMPELLED SELF-DISCLOSURE AND CIVIL PENALTIES: THE LIMITS OF CORPORATE IMMUNITY IN OIL SPILL CASES,
For primary bibliographic entry see Field 5G.
W76-05186

DEFICIENCIES IN THE REGULATORY SCHEME OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
For primary bibliographic entry see Field 5G.
W76-05187

ENVIRONMENTAL PROTECTION AND THE ROLE OF THE CIVIL MONEY PENALTY: SOME PRACTICAL AND LEGAL CONSIDERATIONS,
For primary bibliographic entry see Field 6G.
W76-05188

ENVIRONMENTAL PROTECTION IN CALIFORNIA: COURT ACTION POWERS OF STATE AND LOCAL GOVERNMENT ATTORNEYS,
For primary bibliographic entry see Field 6G.
W76-05189

ENVIRONMENTAL CLASS ACTIONS IN THE FEDERAL COURTS - PEERING THROUGH THE ZAHN SMOG,
K. G. Bouchard.
Boston College Industrial and Commercial Law Review, Vol. 16, p. 609-629, (1975), 21 p.

Descriptors: *Water pollution control, *Federal jurisdiction, *Penalties(Legal), *Legal aspects, *Pollution abatement, Judicial decisions, Federal government, Water law, Environmental effects, Jurisdiction, Water pollution, Water quality, Water quality control, Organizations, Legislation, Legal review, Damages.
Identifiers: *Class action suits, Injunctive relief, Rule 23(FRCP), Water Pollution Control Act.

This article discusses the availability of environmental class actions in Federal Courts following the United States Supreme Courts holding in Zahn V. International Paper. In that case the Court held that each plaintiff in a Federal Rule 23(b) (3) class action must satisfy the $10,000 jurisdictional amount. The author thinks this may have a fatal effect on claims of plaintiffs seeking only monetary relief in environmental class actions. However, Zahn will have little effect on environmental class actions where the primary relief sought is injunctive. The author points out that jurisdiction specifically granted to citizens under the Water Pollution Control Act provides an alternative to class actions in most situations covered by the Act. (Nursey-Florida)
W76-05190

COMMON LAW REMEDIES FOR SALT POLLUTION,
R. E. Wardlaw.
Natural Resources Journal, Vol. 15, p. 353-384, (1975), 32p.

Descriptors: *Southwest U.S., *Water pollution, *Saline water intrusion, *Remedies, *Irrigation, Legal aspects, Judicial decisions, Water law, Water rights, Prior appropriation, Competing uses, Water requirements, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality control, Saline water, Penalties(Legal), Farms, Irrigation systems, Common law.
Identifiers: Injunctive relief, Standing(Legal).

This article discusses the common law right of a downstream water rights holder to water of usable quality and, if that right is infringed upon, the legal remedies available to him. In particular it focuses on the problems faced by farmers in the southwest resulting from increased salinity levels in streams used for irrigation. Also examined are legal definitions of pollution, the nature of the appropriative right, and possible sources of legal protection for that right. It is the author's view that a private right holder who uses water for irrigation and whose right is damaged or destroyed by saline pollution has a cause of action against the person responsible, particularly if the polluter's water right is junior in time or priority. From a practical standpoint, however, the individual farmer may find the cost of bringing suit prohibitively high. (Nursey-Florida)
W76-05191

STATE REGULATION OF FEDERAL WATER APPROPRIATIONS: THE CALFORNIA EXPERIENCE,
California State Dept. of Justice, San Francisco.
R. E. Walston.
Rocky Mountain Mineral Law Institute Annual, Vol. 20, p. 721-742 (1975), 22 p.

Descriptors: *Appropriation, *California, *Federal-state water rights conflict, *Administrative agencies, Federal Water Pollution Control Act, Legislation, Regulation, Reclamation, Reclaimed water, Irrigation, Permits, Water, Water law, Legal aspects, Water rights, Irrigation practices.
Identifiers: FWPCA Amendments of 1972, Dam effects, Water rights(Non-riparians).

The Federal Government and the state of California have become involved in a dispute over control of water stored at federal dams. The Central Valley Project is a series of dams, developed by the United States Bureau of Reclamation, to transport water from rural to urban areas. Under California law, each appropriation, including the federal government, must obtain a permit. The State environmental quality act, which requires agencies to consider the environmental effects of such projects, often conflicts with the Bureau's objectives of maximum water appropriation. Recently proposed dams have encountered opposition from environmental groups. In resolving these disputes, courts have recognized that the federal government has animplied right for water appropriation. Where reclamation is the goal, however, it has been argued that state jurisdiction should be paramount because this function serves local interests. The Supreme Court has indicated that the Reclamation Act of 1902 does not allow state regulation of a federal project. However, the 1972 FWPCA amendments strengthen the arguement that some state regulation over federal agencies is desirable. Whether this requires compliance with state procedural requirements has not been determined. (Jenkins-Florida)
W76-05192

MINING AND THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Amax, Inc., Denver, Colo. Law Dept.
For primary bibliographic entry see Field 5G.
W76-05193

THE COLORADO RIVER SALINITY PROBLEM WITH MEXICO,
For primary bibliographic entry see Field 5G.
W76-05194

KENNETH BAILEY MEMORIAL LECTUR' THE SEABED IN LAW',
V. Windeyer.
Federal Law Review, Vol. 6, No. 1, p. 1-25, (1974), 25 p.

Descriptors: *Continental shelf, *International law, *Treaties, *International waters, *Australia, Foreign countries, Judicial decisions, Jurisdiction, Mining, Natural resources, Water law, Political aspects, History, Commercial fishing, Ownership of beds, Boundary disputes, Boundaries(Property), Water rights, Legal aspects.
Identifiers: Territorial waters, Seabed ownership, Legislation(Foreign).

In this lecture the historical antecedents of seabed ownership by the Australian Commonwealth and its states are examined. Seabed ownership is inextricably linked to the idea of the 'Continental Shelf', itself more a political than geological concept. National claims to exclusive rights in the shelf are an extension of the territorial sovereignty concept. However, when the shelf is common to two countries, or has a break in it, this theory is inadequate. Historically, the exercise of colonial jurisdiction over the territorial seabed did not make the seabed a colonial possession. But judicial decisions in other commonwealth nations support the lecturer's conclusion that the commonwealth nation and not its member states have paramount rights in the seabed. The 1973 Seas and Submerged Lands Act incorporates this position. The debate is far from over, however, since rights in territorial seas become increasingly complex as interest in the energy resources of the seabed grows. (Jenkins-Florida)
W76-05195

NEWFOUNDLAND'S CASE ON OFFSHORE MINERALS: A BRIEF OUTLINE,
Newfoundland Ministry of Mines and Energy, St. John's.
C. Martin.
Ottawa Law Review, Vol. 7, No. 1, p. 34-61 (1975), 28 p.

Descriptors: *Ownership of beds, *Canada, *Jurisdiction, *Mining, *Continental shelf, State government, Federal government, Local government, Political aspects, Constitutional law, Legal aspects, Oil industry, Governmental interrelations, Legislation, Treaties, Atlantic ocean, Coasts, Mineral industry jurisdiction, Boundaries(Property).
Identifiers: *Newfoundland, *Offshore mineral rights, Seabed mining, Comparative law, Coastal waters.

The province of Newfoundland claims rights t mineral resources off the continental shelf superi or to those of the Canadian federal government Legal basis for the claim is that ownership of natu ral resources not expressly transferred to th Crown is retained by the provinces. Most com mentators have ignored the complex legal un derpinnings of this claim: One problem is whethe Newfoundland possessed all the rights of sovereign state when it joined Canada. The autho believes that such proof is not essential t establish the province's claim. When continent shelf rights exist, they need not be declared or e ercised. A policy approach to deciding ownersh is unnecessary where the legal position is clea although, in support of provincial ownersh these five basic policy arguments are advance (1) public revenue generation; (2) industri development; (3) social disruption; (4) provinci autonomy; and (5) effective administration. E amined also are Ontario's ownership rights and j risdiction over Lake Erie's natural resourc which serve as precedent for provinicial owne ship of offshore minerals. (Jenkins-Florida)
W76-05196

DEMENTIA PISCATORIA-SANITAS MALT THE INTERNATIONAL SEA SERVICE,
P. G. Lomhoff.
Ecology Law Quarterly, Vol. 4, No. 2, p. 319-3 (1974), 23 p.

Descriptors: *Fishing, *International Joint Co missions, *Fish conservation, *Fish manageme *United Nations, United States, Foreign cou tries, Jurisdiction, Boundary disputes, Le aspects, Regulation, International law, Inter tional waters, Coasts, Adoption of practic Technology, Administration, Administrative ag cies, Water resources development, Fish mig tion, Oysters, Salmon.
Identifiers: Territorial waters, International S Service(ISS), Inter-American Tropical Tuna Co mission(IATTC), Continental Shelf Convention

Declining fish catches and the imminent demise certain fisheries due to overfishing point up need for a strong international regulatory body replace the current hodgepodge of internatio fishing laws. This article surveys some of the le difficulties frustrating fisheries management then advocates United Nations adoption of proposed International Sea Service (ISS) a means of overcoming them. The Service would a U.N. specialized agency providing other U agencies with operational capabilities at sea areas ranging from seabed surveys to meteor gy. As regards international fishing, the ISS wo operate to provide: (1) research to produce data necessary for rational exploitation; (2) edu tion and technical assistance for fishermen fisheries scientists; and (3) regulatory recomm dation for the use of regional or other fisheries ganizations. While the ISS would not encro upon present national sovereignty or perogati its mere presence as a respected neutral scien organization might act as a deterrent to pote violations of international fishing regulati (Parrish-Florida)
W76-05197

ILLINOIS ENVIRONMENTAL LAW--THE N ASSAULT ON WATER POLLUTION,
Hackbert, Rooks, Pitts, Fullagar and Po Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-05198

THE U.K./ICELANDIC FISHERIES CASE,
D. W. Bowett.
The Cambridge Law Journal, Vol. 33, Part 179-181 (1974). 3 p.

Descriptors: *International law, *Fis *Boundary disputes, *International waters,

f the sea, Regulation, Administration, Jurisdic-ion, Foreign countries, Treaties, Political aspects, egal aspects, Judicial decisions, Coasts, Interna-ional commissions, Water, Water law.
dentifiers: *Coastal zones, Water rights(Non-iparians), High seas, Economic zones, referential rights, Coastal waters, Territorial vaters.

he judgement of the International Court of ustice on the Merits of the Fisheries Jurisdiction ase was a ten to four decision in favor of the nited Kingdom, thereby denying Iceland's laims of an exclusive 50-mile fishery zone. The ajority of the court agreed that, in the decade of 960-1970, two concepts had crystallized as custo-ary law: the notion of an exclusive 12-mile shery zone, and the preferential rights of the astal state. Given the long-established United ingdom fishing practice, the court concluded: (1) at an exclusive claim was invalid against the nited Kingdom; (2) that to hold otherwise would e an infringement of the principle of freedom of e High Seas; (3) that a phase-out of United King-om fishing would not be a sufficient recognition their rights; and (4) that the parties were under obligation to negotiate an equitable solution. lso briefly examined are the four dissenting inions, and the relevance of various United Na-ns resolutions supporting a 200 mile 'economic ne'. (Parrish-Florida)
76-05199

OLORADO RIVER SALINITY PROBLEM: AS A SOLUTION BEEN FOUND,
nver Univ., Colo. Coll. of Law
E. Bulson.
ternational Lawyer, Vol. 9, No. 2, p. 283-294 975), 12 p.

scriptors: *Mexico, *Reasonable use, *Saline ter, *Colorado River, *Desalination plants, eaties, Water purification, Water pollution urces, Desalination processes, International v, Riparian rights, Saline water-fresh water in-faces, Saline water intrusion, Mixing, Irrigation ters, Dams, Damages, Costs, Desalination.
ntifiers: International disputes, International urt of Justice.

agreement between the United States and xico was signed in 1973 concerning the lorado River salinity problem. The agreement ls for the construction of a desalination plant in zona, which should reduce the salinity of the ter received by Mexico to a level equal to that at perial Dam in Arizona. This paper analyzes the tribution of the agreement, to show in what ys it differs from past U.S. policy and in what ys it can serve as precedent for the amicable olution of international river disputes. The nity problem was the result of the 1944 Water aty under which the United States was to ver water from the Colorado River to Mexico. United States contended for many years that bligation was to deliver any type of water, and necessarily usable water. Mexico threatened to its case to the International Court of Justice re it would have argued that, while the lower rian cannot expect water of the same quality as upper riparian, he has a right to water of onable quality for reasonable purposes. It is ly that the International Court would have ed with this argument; hence, the new alination plant. (Hoffman-Florida)
5-05200

LOCATION OF FUTURE WATER USE BY A LIC UTILITY (CASE COMMENT ON IN-WEST CORP. V. PUBLIC SERVICE COM-SION),
berry.
n Law Review, Vol. 1974, No. 2, p. 444-452 4), 9p.

Descriptors: *Water allocation(Policy), *Preferences(Water rights), *Water rights, *Public utilities, Beneficial use, *Utah, *Permits, Future planning(Projected), Legislation, Project planning, Prior appropriation, Regulation, Judicial decisions, Water demand, Water control, Water supply, Distribution, Water requirements.
Identifiers: Water rights(Non-riparian), State policy, Future allocation system, Western states.

The policy behind water law in the western states where water is scarce is to assure an adequate water supply for the greatest public benefit. The doctrine of beneficial use, codified under Utah law, gives preference to prior appropriators of water who continue to make immediate and beneficial use of the water. In determining who has prior beneficial rights the permit system is used. In Interwest Corp. v. Public Service Commission, the Utah Supreme Court applied the beneficial use doctrine to public utilities and held that the state utility regulatory body could not sanction denial of a permit based on future use of water. The court based its holding on a narrow statutory ground, but implied that a public utility which rendered services based on future allocation of water would be exercising unlawful discrimination. The court left unresolved the conflict between water law principles and the regulatory agencies' obligation to provide for the orderly and economical development of public utility resources. Without a future allocation system, developers cannot be assured of a continuing adequate water supply. Such certainty is good public policy. However, discrimination against prior appropriators would be inevitable under a future allocation system, and such discrimination is clearly prohibited by statute. The holding in the instant case invites legislation which would authorize a public utility to use a future allocation system. (Jenkins-Florida).
W76-05201

PEOPLE'S CHINA AND THE LAW OF THE SEA,
C. D. Bethill.
The International Lawyer, Vol. 8, No. 4, p. 724-751 (1974), 38 p.

Descriptors: *Law of the Sea, *Foreign countries, *Foreign waters, *Continental shelf, *Beds under water, Beds, Ownership of beds, Navigable waters, Navigation, Governments, Asia, International law, International waters, Water law, Zoning, Oceans, Fishing, Straits, Bays, Sounds, inland waterways, Islands, Research and development, Jurisdiction, Political aspects.
Identifiers: Coastal waters, Territorial waters, Water rights(Non-riparians).

This article describes the Chinese position on questions concerning their territorial sea, zones of special jurisdiction, the high seas, the continental shelf, and the deep sea bed. The author comments on the differences between the Chinese position and other states, and analyzes their motivations and goals. First, the author presents the Chinese definition of the territorial sea and discusses the determination of its breadth, and the Chinese claim as to the extent of their own territorial sea. Further, the author considers navigational rights through the straits and bays in the vicinity of coastal islands. Generally, the Chinese have supported the doctrine of freedom of the high seas, but have taken a severely restrictive view of foreign passage through territorial waters. In order to protect coastal state fishing, the Chinese favor the creation of certain zones of special jurisdiction in the area beyond the territorial sea. Yet, the article suggests that the Chinese position on the seabed is that the resources are commonly owned by all peoples in the world. While the Chinese Government lacks specificity in its positions, they may be expected to increase their interest and involvement in the area of law and politics. (Fernandez-Florida)
W76-05202

THE ECONOMICS OF CLEAN WATER - 1973.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05203

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT,
Coastal Zone Management Inst., Sandwich, Mass.
For primary bibliographic entry see Field 6B.
W76-05204

COAST GUARD MISCELLANEOUS-PART 2(CONVENTION ON HIGH SEAS POLLUTION H. R. 5975).
For primary bibliographic entry see Field 5G.
W76-05205

FLOOD DAMAGE.
House of Rep. Comm. on Public Works, Rep. No. 93-1482, 93d Cong, 2d Sess, Nov. 19, 1974. 4 p.

Descriptors: *Legislation, *Federal government, *Oysters, *Flood damage, *Estuarine fisheries, Fisheries, Louisiana, United States, Water law, Legal aspects, Floods, Flood control, Estuaries, Salinity, Flood routing, Floodgates, Flooding, Floodwater, Salt balance, Saline water, Equity, Leases, Mississippi River Basin, Mississippi River.
Identifiers: *Oysterbeds, Coastal waters, Sovereign immunity.

The Committee on Public Works has recommended the passage of S. 2201, a bill providing for the settlement of damage claims arising out of actions taken by the United States in opening certain spillways. Flooding in the Mississippi River Valley in the spring of 1973 made it necessary to open the Bonnet Carre spillway and the Morganza Floodway in order to direct waters from populated areas downstream. This action was successful but had serious adverse effects on oysterbeds into which the diverted waters flowed. Sixty-eight percent of all the oysterbeds under lease by the State of Louisiana were affected. This legislation authorizes the President or his designee to settle claims against the United States for losses incurred by oyster fishermen. The Committee believes that this relief is justified since the damages were the direct result of actions of the Army Corps of Engineers, and affected fishermen may loose their livelihood for two or more years. It is intended that such relief will be granted only to those holding a leasehold or similar property interest. The cost to the United States resulting from this legislation is not to exceed $5 million. (Schilling-Florida)
W76-05206

EMERGING OCEAN OIL AND MINING LAW,
North Carolina Univ. at Chapel Hill. School of Law.
S. W. Warfel.
Available from the National Technical Information Service, Springfield, Va, 22161, as COM-74-11014, $3.75 in paper copy, $2.25 in microfiche. Prepared for NOAA Sea Grant Program, North Carolina State University, Raleigh, NC, COM-74-11014, March 1974. 61 p, 58 ref, 3 map.

Descriptors: *International law, *Oil industry, *Mining, *Offshore platforms, International commissions, Foreign waters, Treaties, Law of the Sea, International waters, China, Boundary disputes, Mining engineering, Exploration, Manganese, Continental shelf, Oceans.

Six papers by different authors explore aspects of ocean resource law, primarily from an international perspective. 'International Regulation of Petroleum Exploration' describes economic and legal barriers to deep-water resource utilization. Multinational control of oil spills, tanker discharge, and off-shore drilling is examined via

international agreements, while Chinese response to offmshore drilling is treated geopolitically. Exploitation of manganese nodules and, more broadly, non-living oceanic resources are considered. Analysis of the North Carolina Oil Pollution Control Law and state efforts to curb pollution of the sea completes this well annotated research document. (Knocke-Florida)
W76-05207

TENNESSEE VALLEY AUTHORITY POLLUTION PREVENTION FACILITIES.
House of Rep. Conference Report No. 93-1512, 93d Cong, 2d Sess, Dec. 3, 1974. 5 p.

Descriptors: *Water pollution control, *Tennessee Valley Authority, *Facilities, *Legislation, *Federal government, State governments, Governmental interrelations, Water, Water law, Legal aspect, Water pollution sources, Abatement, Water pollution, Air pollution, Costs.
Identifiers: Certification, State policy.

A Congressional conference committee has agreed on amendments to the Tennessee Valley Authority (TVA) Act of 1933 which provide that expenditures for pollution control facilities will be credited against required power investment return paymets and repayments. Beginning in fiscal year 1976, the Corporation may elect to defer scheduled payments for one year if expenditures for certified pollution control facilities for the preceding fiscal year exceed the amount of the scheduled repayment. During the same period the corporation will be entitled to credit against payments, required as a return on investment, the amount of expenditures which are in excess of the amount of any deferred repayment. The term 'certified pollution control facility', defined in the amendment, applies to both water and air pollution control facilities. For deferral or credit to be obtained the facilities must be certified by the appropriate State certifying agency as being in conformity with State pollution policies, and by the Administrator of the Environmental Protection Agency as being in compliance with applicable Federal regulations; and in furtherance of general pollution control policy under the Federal Water Pollution Control Act and the Clean Air Act. (Schilling-Florida)
W76-05208

EXTENSION OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972.
For primary bibliographic entry see Field 5G.
W76-05209

PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENERGY APPROPRIATION BILL, 1975.
Hearings--Subcomm of the Comm. on Appropriations, U.S. House of Representatives, 93d Cong, 2d Sess, part 6, 1974. 284 p.

Descriptors: *Tennessee Valley Authority, *Federal government, *Economics, *Water management(Applied), *Flood control, Administrative agencies, Administrative costs, Administrative decisions, Navigation, River, Navigable rivers, Inland waterways, River systems, Dams, Regulation, Transportation, Comprehensive planning, Resources development, Interstate commission, Government supports, Water resources development, Resources allocation, Intergovernmental relations, Water allocation(Policy), Water law, Water policy, Judicial decisions.
Identifiers: State policy, Private interest groups, Administrative regulations, *Congressional hearings.

The hearing deals with appropriations for the Tennessee Valley Authority (TVA). At that hearing the chairman of the TVA outlined the proposals and specific plans sought to be funded in the following year. Inter alia the hearing concentrated on several issues of specific importance to water law. After highlighting the environmental awareness and concern for environmental protection, current problems were discussed. The delay in the closure of Tellico dam was due to a suit by environmentalists invoking the National Environmental Policy Act which, although ultimately resolved in favor of the TVA delayed closure by seven years. Similarly, dam xonstruction on the Duck River Project was enjoined and is being litigated. Other dam and waterway improvement programs are referred to and reviewed as possible duplications of effort with the Environmental Protection Agency since they relate to water quality management. Included is a project-by-project review of the progress in construction, current litigation, and benefit to sluppers in terms of added navigability of rivers. At the time of the hearing TVA had in excess of 700 miles of navigable river under its authority. In short, the hearing represents an assessment by the TVA of its current and future activities in the areas of water management, quality control and navigation. (Salley-Florida)
W76-05210

PERSPECTIVES ON THE ARMY ENGINEERS WATER MANAGEMENT MISSION,
Corps of Engineers, Washington, D.C.
W. C. Gribble, Jr.
Water Spectrum, Vol. 6, No. 3, p. 1-9, (1974). 9 p. 10 photo.

Descriptors: *Water resources, *Water resources development, *Flood control, *Flood protection, Flooding, Floods, Harbors, Great Lakes, Energy, Water, Recreation, Erosion, Erosion control, Erosion rates.
Identifiers: *Environmental Impact Statement(EIS).

1974 marked the 150th anniversary of the Corps of Engineers, prompting the Corps' Chief of Engineers to take stock of the Corps' past experience as well as to contemplate changing public needs. In addition to working on national problems, the Corps is also devoting an increasing share of its planning capabilities to helping state and local authorities develop programs for water resources management in accordance with their own priorities. Corps investments in water resource projects already built have been repaid many times over. Flood control works have brought security from the ravages of floods to hundreds of cities and towns. Deep-draft harbors have opened the cities of our seacoasts and Great Lakes to the flow of international commerce. Inland waterways have linked vast internal regions together through an effective low-cost transportation system. Other benefits of Corps programs have included better water supply, recreation, erosion control and provision for fuller utilization of unemployed or underemployed resources in depressed areas. It is expected that the historical record of accomplishment under the Corps Civil Works Program, which has been both substantial and responsive, will continue to meet the Nation's expanding needs. (Gagliardi-Florida)
W76-05211

REGULATION ADOPTING EFFLUENT LIMITAIONS AND GUIDELINES FOR WASTEWATER DISCHARGES TO THE SURFACE WATERS OF NORTH CAROLINA.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Environmental Management.
For primary bibliographic entry see Field 5G.
W76-05212

SEWAGE TREATMENT AND DISPOSAL SYSTEMS.
Ore. Stat. Sects. 454.010 thru 454.745, 1973. 7 p.

Descriptors: *Bond issues, *Oregon, *Federal Water Pollution Control Act, *Rates, *Sewage treatment, Disposal, Municipal wastes, Industrial wastes, Legislation, Financing, Economics, Construction costs, Maintenance costs, Regulation, Inspection, Permits, Penalties(Legal).
Identifiers: *Sewage disposal systems, Procedural requirements.

Pursuant to the Federal Water Pollution Control Act, Oregon may require each user of the treatment works of a municipality to allow inspection to insure compliance with pretreatment effluent standards. In addition, to insure that sewage treatment costs are equitably apportioned, municipalities may institute a rate system designed to make each recipient of treatment works pay his proportionate share. Under this statute, industrial users may be required to pay the cost of treatment works needed to meet the users waste requirements. Similar powers are given to municipalities concerning the ratemaking and financing of disposal systems. In addition, municipalities may also issue bonds for the construction of a disposal system if their issuance is approved by a majority of the electorate. The statutes also allow the installation and maintenance of alternate sewage disposal systems if a permit is obtained. A list of factors is presented which should be considered by the appropriate agency when adopting standards for the regulation of such systems. Finally, the statute presents regulations governing sub-surface sewage disposal systems. These regulations cover various aspects including: standards for such system; procedural requirements when violations of standards are alleged; thepermit system; inspection requirements; the performance of sewage disposal services; and the legal penalties for violation of any provision. (Hoffman-Florida)
W76-05213

WASHINGTON WASTES DISCHARGE PERMITS.
Washington Pollution Control Commission, Olympia.
1973 BNA Environmental Rep. 941: 0621 (Wash. Ad. Code, Ch. 372-24, 1968). 2 p.

Descriptors: *Washington, *Industrial wastes, *Permits, *Water pollution, *Water pollution control, *Waste disposal, Legislation, Legal aspects, Law enforcement, Regulation, Water law, State governments, Water pollution sources, Water quality, Water quality control, Pollutants, Pollution abatement.

The State of Washington has adopted regulations for the issuance of permits for the discharge of wastes into state waters. These regulations provide that persons operating specified types of commercial or industrial operations must obtain a permit if they intend to use state water for the disposal of wastes. Any commercial or industrial operation not specifically listed must also obtain a permit if it discharges significant amounts of wastes. A temporary permit will be issued if operation require time to correct its present waste disposal system to conform to legal requirements. A permanent permit will be issued when an applicant fully complies with conditions specified by the pollution control commission and the commission finds that the operation's proposed disposal of wastes does not unduly pollute the receiving water. Furthermore, any person conducting any operation which results in the discharge of waste material into state waters without first complying with permit requirements will be deemed in violation of the Pollution Control Act. (Nursey-Florida)
W76-05214

OIL SPILLAGE REGULATION.
1974 BNA Environmental Rep. 886: 0105-06 (Rev. Stat. Sects. 468.780 thru 468.815 and Sec. 468.992). 2 p.

Descriptors: *Oregon, *Oil spills, *Oil waste, *Cleaning, *Water quality control, Oil pollution, Waste water(Pollution), Economics, Penalties(Legal), Legal aspects, Damages, Water pollu-

ion sources, State jurisdiction, Federal jurisdic-ion, Permits, Water policy, Costs, State govern-nents.
dentifiers: *Oil clean-up operations.

n order to protect the environment, the Oregon egulation makes it unlawful for oil to enter state vaters from any source. Except for certain statu-ory exceptions, the person having control of the il shall be absolutely liable for the damage caused y such spills unless he had obtained a permit. In ddition to other liabilities, the person having con-rol of the oil shall be required to collect and emove the oil immediately. If the oil's collection s not possible, the person must take all practicable ctions to contain, treat or disperse the oil. Any ubstance used to aid in such action which is found o be harmful to the public interest may be subject o restriction or prohibition. If the person fails to ake any steps to collect the oil, the state is uthorized to begin the clean-up operation. dequate expense records must be kept so that the ffender can be charged for all reasonable costs ncurred. If these expenses are not paid, the state ttorney general is authorized to bring suit for its ollection. Penalties which are collected go into he Oil Spillage Control Fund, which will finance ecessary state actions under these provisions. Hoffman-Florida)
/76-05215

YOMING ENVIRONMENTAL QUALITY CT,
975 BNA Environmental Rep. 956:0201-18 Enrolled Act No. 107., 1973, as amended 1974 and 975). 18 p.

escriptors: *Wyoming, *Administrative agen-es, *Water quality standards, *Solid wastes, Permis, Effluents, Waste disposal, Water supply, ersonnel, Training, Administratives decisions, ecision making, Regulation, Legislation, Water sources development, Natural resources, State overnment.
entifiers: *Disposal sites.

o serve as the central governmental unit in over-eing the protection and development of state tural resources, the Wyoming Department of nvironmental Control is created. The department ll consist of three divisions, land, air and water; d the director shall appoint an administrator to ad each of these divisions. The administrator of e water division shall be vested with numerous wer including: the power to issue, deny or voke permits; the power to require owners or erators of any point source to maintain adequate cords and provide periodic sampling of effluent scharges; and the power to supervise all research ojects and investigations. The administrator will o make recommendations to the director con-rning the promulgations of regulations pertain-to water quality standards, effluent standards d limitations, standards for technical competen-and certification of water supply and sewerage stem operating personnel, and standards for the uance of permits.A list of factors is presented ich should be considered by the administrator recommending any standards or regulations. e director of the department is given the hority to coordinate state activities concerned h solid waste management and must give his ap-val to all proposed solid waste disposal sites. If ter quality standards would be violated at the posed site, approval will be denied.(Hoffman-rida)
6-05216

OMING PROTECTION OF PUBLIC WATER PPLY ACT,
3 BNA Environmental Rep. 956:0101-03 (Wyo. tection of Pub. Water Supply Act as amended Senate Enrolled Act No. 107, 42d sess. 1973). 3

Descriptors: *Wyoming, *Potable water, *Public health, *Water supply, *Permis, Inspection, Saw mills, Minning, Water quality standards, Water quality control, Domestic water, Water purification, Water pollution, Sewage disposal, Waste water treatment, Watersheds(Basins), Water purification.
Identifiers: Administrative investigation.

To insure a high quality of public drinking water, the Wyoming State Board of Health must advise local authorities on the best methods for assuring water purity. In addition, the Board must approve all permits before any municipally, individual or corporation may construct or make additions to any water supply, drainage or sewage disposal system. Approval must also be obtained for the construction of specified structures upon or over any watershed of any public water supply system. To insure compliance with these regulations, the Board of Health is authorized to initate a thorough investigation upon the receipt of any complaint alleging the unauthorized pollution of any water supply source. To aid in such investigations, the Board is authorized, upon the issuance of a search warrant, to inspect any building or premise where a water supply violation is thought to exist. Any person who is adversely affected by the actions of the Board may appeal to the appropriate court. Because of the severe pollution that can be caused by sawmills and mining operations, a special provision relating to their regulation is presented. Finally, the statue requires that the Board make periodic bacteriological analyses of drinking water supplies. If predetermined quality standards are not met, immediate action must be taken by the operator of the water supply system. (Hoffman-Florida)
W76-05217

MONTANA ENVIRONMENTAL POLICY ACT,
Montana Environmental Quality Council, Helena.
1973 BNA Environmental Rep 831:0201-04 (Mont Rev Code, Title 69, Ch 65, 1971). 4p.

Descriptors: *Montana, *Natural resources, *Legislation, *Adkministrative decisions, *Environmental control, Environment, Ecology, Safety, Programs, Projects, Jurisdiction, Maintenance, Planning, Management, Conservation, Investigations, Air, Surveys, Groundwater, Surface waters, Labor, Argriculture.

Montana has adopted an Environmental Policy Act the purpose of which is to declare a state policy encouraging 'productive and enjoyable harmony between man and his environment'. Under the Act it is the responsibility of the state and its agencies to carry out this policy to the fullest extent possible. An environmental quality council consisting of thirteen members is established, no member of which shall serve for more than six years. In addition, a qualified executive director shall be appointed by the council to serve for two years, but subject to removal for cause at any time after notice and a hearing. The executive director may appoint what-ever employees are necessary to carry out the duties specified in the Act and shall make available to the governor, the legislature, and the general public an annual environmental quality report. Finally, the council shall have authority to hold hearings and shall have all authority necessary to conduct such hearings. (Segall-Florida)
W76-05218

NEBRASKA DOMESTIC AND INDUSTRIAL LIQUID WASTES DISPOSAL RULES.
Nebraska Environmental Control Council, Lincoln.
1973 BNA Environmental Rep 836:0541-42 (Neb Environ Control Council Rules and Regs, 1972). 2p.

Descriptors: *Construction, *Water quality standards, *Nebraska, *Waste water treatment, *Waste water disposal, Water pollution control, Water quality, Water pollution, Water pollution treatment, Sewerage, Water quality control, Waste water(Pollution), Sewage treatment, Sewage effluents, Sewage disposal, Sewage, Pollution abatement, Waste disposal, Administrative decision.

To implement the Nebraska Water Quality Standards Act, the Nebraska Environmental Control Council herein sets forth the rules and regulations pertaining to disposal of domestic and industrial liquid wastes. The policy of the Council is to prevent, control and abate existing or potential pollution by monitoring such pollution by liquid discharge, and by enforcing the rules under this Act. Any waste water discharge is prohibited unless prescribed treatment has been provided and such treated wastewater is notdetrimental to the quality of the receiving waters or lands. All sewage works must submit complete plans and drawings for any new constructions or alterations, and such works must be capable of meeting the effluent standards of the Act. Any material changes in the approved plans and specifications which affect either capacity or sanitary features must be submitted along with a written statement of the reasons for such changes. A construction permit is valid only if construction is started within one year and is completed within three years of the date of approval. Failure to comply with these regulations is grounds for both administrative enforcement and criminal proceedings. A schedule of fines is set forth. (Welch-Floria)
W76-05219

KANSAS AGRICULTURAL WASTES REGULATIONS.
1973 BNA Environmental Rep 781:0701-02 (Kan Stat, Ch 28, Art 18, 1967). 2p.

Descriptors: *Kansas, *Waste water(Pollution), *Feed lots, *Permits, *Waste treatment, Water pollution control, Ponds, Foods, Crops,Cattle, Sheep, Lagoons, Fish, Wastes, water quality, Public health, Beneficial use. Discharge(Water), Drainage, Streams, Surface runoff, Drainage area.

Under Kansas' Agricultural Wastes Regulations the operation of any newly proposed confined feeding operation for food animals, fur animals, or pleasure animals, must register with the State Department of Health prior to construction and operation of any lot, pen, pool, or pond. If in the opinion of the department a confined feeding operation has water pollution potential, the operator shall provide water pollution control facilities constructed in accordance with plans and specifications approved by the department. Water pollution control facilities shall not be placed in use until a permit has been issued following satisfactory completion of construction in accordance with plans and specifications approved by the department. Minimum requirements for water pollution control facilities for cattle, swine sheep, and other domestic animals are set forth. Finally the water pollution control facilities shall be operated and maintained so as to prevent water pollution, to protect the public health, and to insure the beneficial use of waters of the state. (Segall-Florida)
W76-05220

MICHIGAN GENERAL PROVISIONS AND PROCEDURES REGULATIONS.
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
1973 BNA Environmental Rep 811:0501-03 (Mich Ad Code Part 1, Gen Prov, and Part 2, Orgs, Ops, and Proceds 1972). 3 p.

Descriptors: *Michigan, *Water resources, *Administrative agencies, *Adoption of procedures, *Waste disposal, Water pollution control, Flood control, Natural resources, Agriculture, Public health, Inspection, Conservation, Permits, Sewage treatment, Construction, Grants,

Surveys, Discharge(Water), Beach erosion, Flood plains.

Michigan has adopted 'General Provisions and Procedures' for regulating the organization of the water resources commission of the state. The commission is to administer programs of water pollution control, water planning basic data collection flood control, beach erosion control and others. The commission is also authorized to issue orders and permits for filling and other regulated activities in flood plains. A person can thus request a declaratory ruling from the commission regarding a statute, rule or order administered thereby, upon submission in duplicate of a sworn petition to the commission. The commission will issue the declaratory judgement within 90 days of the receipt of such a petition. Also the commission is to hold public hearings on water pollution control problems. The executive secretary of the commission can seek the initiation of injunctive procedures to prevent the release of waste discharges from industrial or commercial processing operations into waters of the state. (Segall-Florida)
W76-05221

LICENSING AND REGULATION OF USE OF OIL SPILL CLEANUP AGENTS.
1974 BNA Environmental Rep 721:0527-29 (Calif. Water Code). 3 p.

Descriptors: *Water quality control, *Permits, *California, *Oil spills, *Oil pollution, Pollutants, Pollution abatement, Water pollution, Water pollution control, Water pollution treatment, Legal aspects, Regulation, Administrative agencies, Adoption of practices, Disasters, Oil, Legislation, State governments, Environmental control, Environmental effects, Oil wastes, Oily water.
Identifiers: *Licenses.

Pursuant to its goal of preventing and minimizing effects of oil spills, the state of California herein regulates the characteristics and application of substances used for cleanup operations to insure that the substances will effectively protect the environment. Any oil spill cleanup agent (OSCA) must be licensed by the state. This includes any substance applied to oil or water or associated shorelines for the purpose of oil dispersal or control. Each OSCA must comply with enumerated criteria, including a specified flash point, dispersant efficacy, and dispersant toxicity. Any OSCA must also be plainly labeled as such and must include recommended application procedures. A license may be issued to the manufacturer for each OSCA on a registered trademark name basis when the criteria have been met and tests have been submitted. The filing fee for an application is $100 plus a deposit of $900 to defray testing expenses. Finally, a license for an OSCA does not waive any other legal responsibilities of the manufacturer or user. (Welch-Florida)
W76-05222

ALASKA WASTEWATER DISPOSAL REGULATIONS.
1974 BNA Environmental Rep. 706: 0541-43 (Alas. Ad. Code (ACC), Title 18, Environ. Conserv., Ch. 72, 1973). 3 p.

Descriptors: *Permits, *Alaska, *Waste disposal, *Water pollution control, *Waste water(Pollution), Water pollution treatment, Water pollution, Waste water treatment, Waste water disposal, Water management(Applied), Water quality, Water purification, Sewage effluents, Sewage treatment, Administration, Legislation, State governments, Discharge(Water), Disposal, Penalties(Legal), Regulation, Environmental control, Surface waters, Subsurface waters, Septic tanks.

The discharge of sewage, industrial waste or wastewater in Alaska must meet the minimum required treatment standards as prescribed by statute. Moreover, the regulations forbid the discharge of surface wastewater into waters of the state or onto land nearby such waters. Any subsurface wastewater discharge is likewise prohibited without written state approval. Specific regulations applicable to septic tanks and soil absorption systems require written approval if construction or use of such a system is within 200 feet of a community sewerage system. Any agency constructing or modifying a sewerage system or treatment works must submit detailed engineering reports and specifications before beginning such construction. Furthermore, any agency or person operating a wastewater treatment works must also submit routine operational reports. Notification of any emergency situation in the operation of the treatment works must be given within 24 hours. Penalties for violation of any provision of the statute include fines and-or imprisonment. (Welch-Florida)
W76-05223

NEBRASKA FLOOD PLAIN REGULATIONS ACT.
For primary bibliographic entry see Field 6F.
W76-05224

REGULATION OF CONSTRUCTION WITHIN FLOOD PLAINS ESTABLISHED PURSUANT OF SECTION 65F, CHAPTER 19, ILLINOIS REVISED STATUTES.
For primary bibliographic entry see Field 6F.
W76-05225

CHANGES IN 1972 COLUMBUS CITY CODE (FLOOD HAZARD ORDINANCE.)
For primary bibliographic entry see Field 6F.
W76-05226

MODEL FLOOD PLAIN ZONING ORDINANCE (OHIO),
Mid-Ohio Regional Planning Commission, Columbus.
For primary bibliographic entry see Field 6F.
W76-05227

A THREE-DIRECTIONAL APPROACH TO FLOOD PLAIN MANAGEMENT, MINNESOTA EXPERIENCES,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6F.
W76-05228

ORDINANCE AMENDING SECTION 7-1 AND 7-2 OF ARTICLE 1 OF THE COLLIER COUNTY BUILDING CODE (FLOOD PLAIN AND COASTAL CONSTRUCTION).
For primary bibliographic entry see Field 6F.
W76-05230

FEDERAL LEGISLATION AND COMMON LAW ASPECTS OF ENVIRONMENTAL PROBLEMS IN CANADA,
Atlantic Richfield Canada Ltd., Calgary (Alberta).
B. L. Stroppa.
Alberta Law Review, Vol. 13, No. 1, p. 18-40 (1975). 23p, 217 ref.

Descriptors: *Oil industry, *Common law, *Oil pollution, *Canada, *Environmental effects, Geographical regions, Air pollution, Water pollution, State governments, Political constraints, Riparian rights, Water quality, Federal government, Judicial decisions, Legal aspects, Permits, Penalties(Legal), Regulation.
Identifiers: Canada Shipping Act, Arctic Water Pollution Prevention Act, Northern Inland Waters Act, Canada Water Act, Fisheries Act, Navigable Waters Act, Canadian Oil and Gas Production and Conservation Act, Clean Air Act, Nuisance(Legal aspects), Comparative law.

Due to potential adverse environmental effects, petroleum industry activity is subject to considerable statutory regulation in Canada. To provide a general background for this regulation, a brief survey of important legislation is presented concerning five specific geographical areas in Canada. The major acts discussed include: the Canada Shipping Act, the Arctic Water Pollution Control Act, the Northern Inland Waters Act, the Canada Water Act, the Fisheries Act, and the Navigable Waters Act. This statutory regulation is not all encompassing, however, and common law rights and remedies are often relied upon in ascertaining causes of action or liability in environmental suits. In order to update the significance of these common law actions as they relate to environmental litigation, a survey of pertinent case law pertaining to strict liability, nuisance, riparian rights, defenses to nuisance, and negligence is presented. This history notwithstanding, legislative regulation of environmental matters will become increasingly more important in Canada, while common law actions will be used only to fill in the gaps not covered by legislation. (Hoffman-Florida)
W76-05231

HEALTH ASPECTS OF UNCOVERED RESERVOIRS,
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 5F.
W76-05232

EVALUATION OF STATE DRINKING-WATER QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga Region IV.
For primary bibliographic entry see Field 5G.
W76-05233

AN ORDINANCE RELATING TO DRAINAG AND FLOOD CONTROL.
County of Kauai, Hawaii, Ordinance No. 15 (1971). 2 p.

Descriptors: *Hawaii, *Drainage, *Flood contro *Flood damage, *Permits, Storms, Floods, Safet Rainfall, Overflow, Streams, Rivers, Hurricane Runoff, Land use, Channels, Structures, Co struction, Tsunamis.
Identifiers: Tsunami inundation.

This ordinance recognizes that heavy rain storm tsunamis, and hurricanes have caused floo resulting in loss of life and damage to propert The purpose of the ordinance is to regula development in areas subject to flooding. N building permit shall be issued and no subdivisi shall be approved without the approval of t County Engineer as to the adequacy of drainag Any applicant for a building permit may required by the County Engineer to submit pla for the improvement or construction of draina facilities. Also any proposed new construction a proposed building site located in an area subje to extreme water heights and destructive wa forces must be designed and constructed to res the damages. (Segall-Florida)
W76-05234

FLOOD CONTROL AND FLOOD WATER CO SERVATION.
Hawaii Rev. Laws, secs 179-1 thru 179-4 (1963) p.

Descriptors: *Hawaii, *Flood contr *Floodwater, *Safety, *Flood damage, Benefic use, Rainfall, Drainage, Seismic waves, Surfa waters, Subsurface waters, Runoff, Condui Ditches, Canals, Dams, Reservoirs, Build codes, Construction, Rivers, Streams, Lak Zoning.
Identifiers: *Floodwater conservation, Flood c trol projects.

The purpose of this chapter is to provide for the coordination by the state of all federal and state flood control projects undertaken in Hawaii. Upon enactment of this law, all flood control and flood water conservation and related activities, and any attendant powers and duties, not including flood disaster operations, are transferred to the Board of Land and Natural Resources. The flood control plan is to be regarded as a general guide for implementation of a statewide flood control program. The powers, duties and jurisdiction of the Board, including coordination of programs and activities, compilation and dissemination of information, rendition of technical assistance to political subdivisions, and formulation of flood control projects, are set forth. (Segall-Florida)
W76-05235

AN ORDINANCE AMENDING THE GREENSBORO CODE OF ORDINANCES WITH RESPECT TO ZONING.
For primary bibliographic entry see Field 6F.
W76-05236

LAND USE MEASURES TO HELP PREVENT FLOOD HAZARDS AND LOSSES IN FLOOD PLAIN AREAS.
For primary bibliographic entry see Field 6F.
W76-05237

AMENDMENTS TO BUILDING CODE TO PREVENT FLOOD HAZARDS AND LOSSES.
For primary bibliographic entry see Field 6F.
W76-05238

PROPOSED FLOODPLAIN REGULATIONS FOR THE GREATER ANCHORAGE AREA BOROUGH.
Greater Anchorage Area Borough, Alaska. Planning Dept.
For primary bibliographic entry see Field 6F.
W76-05239

PERMITS FOR CONSTRUCTION BELOW HIGH WATER MARK.
South Carolina State Budget and Control Board, Columbia.
S. C. Code Ann., Vol. 17, Rules and Regulations, 138 (1974 Comm. Supp.). 1 p.

Descriptors: *South Carolina, *Legislation, *Construction, *High water mark, *Permits, Legal aspects, Ownership of beds, Excavations, Regulation, Water law,Water rights, Water quality, Water quality control, Navigable waters, Bed.

The state of South Carolina requires that a permit be obtained for any construction or excavation below the usual high water mark of all navigable waters within the state. All such permits shall be issued by the Division of General Services. (Jursey-Florida)
W76-05240

PROPOSED PENNSYLVANIA FLOOD DISASTER PREVENTION ACT.
For primary bibliographic entry see Field 6F.
W76-05241

SAMPLE ZONING REGULATIONS FOR THE MANAGEMENT OF FLOOD HAZARD AREAS.
For primary bibliographic entry see Field 6F.
W76-05242

PATSON V STATE (PLAT OWNERS ACQUISITION OF SUBSEQUENT ACCRETIONS).
Wp2nd 836-37 (Wash Ct App 1975). 2 p.

Descriptors: *Washington, *Accretion, *Coasts, Beaches, *Boundaries(Property), Water, Water law, Legal aspects, Land, Land classification, Land forming, Boundary disputes, Legal review, Judicial decisons, Real property.
Identifiers: Coastal lands, Land ownership, Plats, Upland, Ocean front property.

Plaintiff landowner brought action against defendant original platter to quiet title to accreted lands along the Pacific Ocean. Plaintiff asserted his title by reason of ownership of platted property derived through conveyances from the original platter. Defendant contended that the existence of a creek in the original plat, located between plaintiff's land and the ocean, established the existence of upland between plaintiff's tract and the ocean. The Court of Appeals of Washington stated the applicable rule to be that, if at the time it was recorded the plat extended to the water's edge, the owners of the tracts facing the ocean acquire title to subsequent accretions. However, if a strip of uplands existed between the platted property and the water's edge, title to subsequent accretions is acquired by the owner of the intervening uplands. The court affirmed a judgment for plaintiff, ruling that there was sufficient evidence to support the trial court's conclusion that the overall design of the plat was such as to give beach property to the purchasers, and that the existence of the creek in the original plat did not preclude this result. (Schilling-Florida).
W76-05243

CLEARING UP THINKING ON POLLUTION LAWS,
For primary bibliographic entry see Field 5G.
W76-05316

THE GENESIS AND FUNCTION OF THE FOURTH WATER RESOURCES COUNCIL ACCOUNT,
Office of the Chief of Engineers (Army), Washington D. C. Civil Works Directorate.
For primary bibliographic entry see Field 6B.
W76-05355

GOVERNMENT AGENCY EFFORTS IN QUALITY OF LIFE IMPACTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W76-05356

THE POLITICS OF INFORMATION: THE SOCIAL WELL-BEING OBJECTIVE,
Arizona Univ., Tucson. Dept. of Government.
For primary bibliographic entry see Field 6B.
W76-05359

PUBLIC PARTICIPATION IN WATER AND WASTE WATER PLANNING,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 6B.
W76-05371

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS--OKLAHOMA,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4A.
W76-05416

INTERNATIONAL EXTERNALITIES AND OPTIMAL TAX STRUCTURES,
University of Western Ontario, London.
For primary bibliographic entry see Field 5G.
W76-05446

IMPACT OF THE SAFE DRINKING WATER ACT,
Environmental Protection Agency. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05449

STATE REGULATORY AGENCIES AND THE SAFE DRINKING WATER ACT,
New Jersey Dept. of Environmental Protection, Trenton, N. J. Bureau of Potable Water.
For primary bibliographic entry see Field 5G.
W76-05450

MANAGEMENT OF WATER QUALITY THROUGH SELECTED INSTITUTIONS AND INSTRUMENTS,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05453

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (FIRST PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 5D.
W76-05483

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (SECOND PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services.
For primary bibliographic entry see Field 5D.
W76-05484

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
For primary bibliographic entry see Field 4A.
W76-05519

6F. Nonstructural Alternatives

AN ENGINEERING EMERGENCY: THE 1974 FLOODS,
Brisbane City Council (Australia). Dept. of Water Supply and Sewerage.
For primary bibliographic entry see Field 4A.
W76-05059

NEBRASKA FLOOD PLAIN REGULATIONS ACT.
Nebraska Rev. Stat., Sec. 2-1506.01 through 2-1506.14 (Supp. 1967), amended by laws 1969, Chapter 18, page 172. 7 p.

Descriptors: *Nebraska, *Flood control, *Floodways, *Obstruction to flow, *Permits, Water courses(Legal aspects), Channels, Beds, Flood plains, Dams, Walls, Embankments, Levees, Dikes, Conduits, Culverts, Gradation, Maintenance, Investigations, Surveys, Repairing, Appropriation, Expenditures, Navigable waters.
Identifiers: *Floodway-encroachment lines, *Artificial obstructions, *Natural obstructions, drainways, Public nuisance.

The Nebraska Flood Plain Regulations Act provides that floodway-encroachment lines are to be established along watercourses and drainways to minimize the extent of floods. The State Natural Resources Commission shall gather data to reasonably locate floodways throughout the state, including floodways for floods of the one hundred year frequency, and shall establish floodway-encroachment lines for such floodways within which a political subdivision may establish land-use regu-

lation. Any artificial obstructions within any floodway is declared a public nuisance unless authorized by permit. The Commission is authorized to issue such permits to make artificial obstructions lawful. Any person who locates or maintains an artificial obstruction without a permit shall be guilty of a misdemeanor. Under certain conditions the Commission has the power to remove natural obstructions and to make reasonable entry onto lands and waters in the state. The Commission also has the power to issue orders and rules to implement this act. The State Treasurer is directed to establish the Floodway Obstructions Removal Fund. Permits granted under this act in no way affect other permits required by the state, political subdivisions, or the United States. (Segall-Florida)
W76-05224

REGULATION OF CONSTRUCTION WITHIN FLOOD PLAINS ESTABLISHED PURSUANT OF SECTION 65F, CHAPTER 19, ILLINOIS REVISED STATUTES.
Illinois, Department of Transportation, Rules and Regulations (Feb. 18, 1975). 21 p.

Descriptors: *Flood plain zoning, *Illinois, *Flood plains, *Flood control, *Construction, Floods, Roads, Sedimentation, Encroachment, Flood stages, Structures, Landfills, Storage, Floodwater, Permits, Channels, Floodproofing, Drainage, Levees, Safety, Flood protection, Flood damage.
Identifiers: Flood fringe, Flood protection elevation, Encroachment limit, Hydraulic analysis, Floodwalls, Water surface profile, Conveyance, Inundation, Improvements.

Illinois has enacted regulations the purpose of which is to protect the public health, safety, and general welfare by restricting flood plain improvements and uses which increase flood damage potential elsewhere. Representative provisions include the following: (1) all construction shall be unlawful if undertaken on the regulatory flood plain, as defined by these regulations, without a permit from the Department of Transportation; (2) permits will ordinarily be granted for construction which does not have significant flood damage potential; (3) a wide range of uses may be permitted in the flood fringe providing such uses are protected to the regulatory flood protection elevation; (4) acceptable methods for providing flood protection include permanent landfills, elevated structures, and structural floodproofing; and (5) temporary fills are permitted if the permittee assumes full liability for flood damage caused by the existence of the temporary fill. Other provisions regulating state flood plains are set forth. (Segall-Florida)
W76-05225

CHANGES IN 1972 COLUMBUS CITY CODE (FLOOD HAZARD ORDINANCE.)
Columbus, Ohio, Ord. No. 835-72 and 847-72 (1972). 7 p.

Descriptors: *Permits, *Floodways, *Building codes, *Flood control, Flood protection, Encroachment, Flood plains, Floods, Streams, Channels, Floodproofing, Flood damage, Structures, Buildings, Food profiles, Safety, Landfills, Water coursesLegal aspects), Rivers, Obstruction to flow, Ohio.
Identifiers: Floodway fringe, Recurrence interval, Flood protection, Inundation, Flood surface elevations, Anchoring.

The purpose of this ordinance is to promote the general welfare of Columbus, Ohio, by lessening flood damage. The floodway is defined to be the channel of a water-course and the adjacent area required to carry and discharge the waters resulting from the 100-year recurrence interval flood. The area chosen for the floodway must be designed to carry the waters of the 100-year flood without increasing the water surface elevation of that flood more than one foot. Within a floodway, buildings and premises can only be put to specified uses, and structures built in the floodway must meet specified requirements. No building or premises in the floodway shall be used for overnight accommodations by human inhabitants. Structures and premises within the floodway fringe must meet zoning specifications. No structure or premises which encroaches upon the abutting floodway shall be used in the floodway fringe. Within a floodway or floodway fringe, no structures shall be erected or altered except upon the issuance of a Certificate of Zoning Clearance. Regulations governing building permit applications and structural requirements are also set forth. (Segall-Florida)
W76-05226

MODEL FLOOD PLAIN ZONING ORDINANCE (OHIO),
Mid-Ohio Regional Planning Commission, Columbus.
H. T. Merwin, T. Richardson, and R. J. Holland.
June 1972, 23 p.

Descriptors: *Ohio, *Flood plain zoning, *Land use, :Flood protection, *Pemits, Floods, Hazards, Safety, Public healh, Structures, Channels, Flood stages, Encroachment, Streams, Flood frequency, Floodways, Floodproofing, Obstruction to flow, Dams, Rivers, Reach(Streams), Maps, Regional flood, Agriculture, Recreation facilities.
Identifiers: *Flooodway fringe, water surface profile, Inundation.

The purpose of this Model Flood Plain Zoning Ordinance is to provide a guide for the adoption of local flood plain ordinances and regulations. It provides for issuance of an Official Zoning Map, which together with other documents, will delineate the landward limits of the Regulatory Flood Plain District. It establishes permitted, prohibited, and conditional uses in the Regulatory Flood Plain Distric t, and conditional uses in the floodway fringe, including flood control works. Conditions are also established for the continued use of structures which were lawful before adoption of the ordinance, but which are not in conformity with its requirements. Permits are required prior to erection or alteration of any structure and prior to a change of use of any structure.Conditions and procedures for application and issuance of such permits, including provisions for public hearings and appeals, are set forth, and flood proofing measures as a condition for issuance of a permit are described Finally, provisions are made for amending zoning maps and for penalties for violation of the ordinance. (Segall-Florida)
W76-05227

A THREE-DIRECTIONAL APPROACH TO FLOOD PLAIN MANAGEMENT, MINNESOTA EXPERIENCES,
Minnesota Dept. of Natural Resources, St. Paul.
J. M. Wright.
Paper presented at National Conference on Flood Plain Management, Washington, D. C. (July 24, 1974). 25 p, 5 fig.

Descriptors: *Minnesota, *Flood damage,*Build ing codes, *Flood plin zoning, Land use, Flood control, Streams, Lakes, Rivers, Water supply, Flood flow, Rainfall, Snowmelt, Floods, High water mark, Maps, Floodways, Buildings, Encroachment, Permits, Structures, Safety, Public health, Waste disposal, Floodproofing, Flood plain insurance, Flood protection.
Identifiers: *Flood plain management, Floodway fringe, Flood protection elevation.

Minnesota, a water-rich state, has suffered much flood damage in the past. In 1969 Minnesota enacted the Flood Plain Management Act in an effort to minimize future flood damage. The Act required all counties and cities to adopt flood plain management provisions within six months after sufficient data became available to define flood hazard areas. The Act provides for detailed investigation and collection of flood management data. The objectives of the flood plain regulations are to restrict dangerous land uses at time of construction, and to protect against flood damage in times of flood. Zoning ordinances, subdivision regulations, building codes that incorporate floodproofing regulations, and sanitary regulations are all used to achieve these objectives. Other measures, including participation in the National Flood Insurance Program, are suggested to supplement these controls. Under the Act the Department of Natural Resources has played an active role, cooperating with local governmental units, other state agencies, and federal agencies in collecting data and providing information on flood plan management. Maps and diagrams are included. (Segall-Florida)
W76-05228

ORDINANCE AMENDING SECTION 7-1 AND 7-2 OF ARTICLE 1 OF THE COLLIER COUNTY BUILDING CODE (FLOOD PLAIN AND COASTAL CONSTRUCTION).
Collier County, Florida, Draft Ordinance to Amend Section 7-1 and 7-2 (April 5, 1974). 4 p.

Descriptors: *Building codes, *Florida, *Flood plains, *Land development, Land use, Construction, Buildings, Permits, H
Identifiers: *Federal Flood Insurance Program.

Collier County, Florida has adopted an ordinance amending the county building code to regulate construction within the flood plain. Representative provisions include: (1) it shall be unlawful to erect any building in flood hazard areas unless constructed in accordance with the requirements established by this ordinance; (2) land within coastal high-hazard areas below the level of the one hundred year flood shall not be developed except as provided in this ordinance; (3) applications for a variance from the provisions of the ordinance shall be accompanied by a survey, and written notices shall be given to applicants; (4) all applications for building permits for new construction or substantial improvements within the flood plain area having special flood hazards must be reviewed to assure that protection against flood damage is provided for; and (5) violation of any provision of this ordinance is a misdemeanor. The purpose of these and other provisions of the new ordinance is to enable Collier County to qualify for subsidized flood insurance under the Federal Flood Insurance Program. (Segall-Florida)
W76-05230

AN ORDINANCE RELATING TO DRAINAGE AND FLOOD CONTROL.
For primary bibliographic entry see Field 6E.
W76-05234

FLOOD CONTROL AND FLOOD WATER CONSERVATION.
For primary bibliographic entry see Field 6E.
W76-05235

AN ORDINANCE AMENDING THE GREENSBORO CODE OF ORDINANCES WITH RESPECT TO ZONING.
City Council, Greensboro, North Carolina
Chapter 23, art. 1X (1971).16, p 2 fig.

Descriptors: *North Carolina, *Flood plain zoning, *Water zoning, *Land use, *Public health, Legislation, Regulation, Nonstructural alternatives, Permits, Maps, Flood protection, Legal aspects, Water policy, Administration, Management, Comprehensive planning, Flood damage.
Identifiers: *Flood hazard areas, Administrative procedures.

The City Council of Greensboro, North Carolina, has adopted an ordinance designed to regulate development within flood hazard areas in order to prevent property damage, injuries and loss of life. As a first step in achieving the goal, the ordinance presents a method which can be used to analyze flood hazard areas. Once this has been done, areas within the zoning jurisdiction of the ordinance are divided into three zones, based upon the probability of floods within the areas. These zones are the floodway zone, floodway fringe zone, and upland zone. Land uses within the floodway and floodway fringe zones are regulated by the ordinance, which presents a list of permitted uses applicable to each zone. These land use regulations will be enforced mainly through a certificate of compliance and permit system under the control of the building inspector. For unusual cases, an administrative procedure is provided which must be followed by individuals seeking a special exception from floodway fringe zone development regulations. In a related action, the ordinance adopts a specified U. S. Army Corps of Engineers Map Series as the Official Flood Zoning Map. (Hoffman-Florida)
W76-05236

LAND USE MEASURES TO HELP PREVENT FLOOD HAZARDS AND LOSSES IN FLOOD PLAIN AREAS.
Board of Directors, Fort Smith, Arkansas, Ordinance to Help Prevent Flood Hazards and Losses, May, 1973. 5 p.

Descriptors: *Arkansas, *Local governments, *Building codes, *Floods, *Flood plain zoning, *Water law, Legal aspects, Regulation, Governments, Waterproofing, Flood plains, Floodproofing, Flood control, Flood damage, Flood water, Flood protection,Maximum probable flood, Legislation.

The City of Fort Smith, Arkansas, has enacted an ordinance to help prevent and alleviate flood hazards and losses in flood plain areas. Ordinance regulations apply to all existing and proposed construction and all filling operations lying within and below the projected 100-year frequency flood plain elevation, New residential structures or additions thereto shall have the lowest habital floor, including basements, elevated to or above the level of the 100-year flood. Regulations are included concerning the design, construction methods, and construction materials of non-habital floor levels and detached utility buildings. New non-residential structures or additions thereto shall have the lowest floor elevated to or above the level of the 100-year flood, or shall be flood proofed up to the level of the 100-year flood. Structures in existence which would be prohibited by this ordinance may be repaired or altered only by use of construction methods and materials which will minimize flood damage. In riverine situations, no use may be permitted which would increase the surface elevation of the 100-year flood more than one foot at any point. With respect to subdivisions or other new developments, proposals shall meet standards set forth in this ordinance. Water supply systems and/or sanitary sewer systems shall be designed to minimize infiltration of flood water and discharge from the systems into flood waters. (Schilling-Florida)
W76-05237

AMENDMENTS TO BUILDING CODE TO PREVENT FLOOD HAZARDS AND LOSSES.
Fayetteville, Arkansas, Ordinance 2018 (1974). 4 p.

Descriptors: *Arkansas, *Local government, *Legislation, *Floods, *Flood plain zoning, Water, Water law, Legal aspects, Regulation, Governments, Waterproofing, Flood plains, Floodproofing, Flood control, Flood damage, Flood water Flood protection, Building codes, Maximum probable flood, Penalties(Legal).

The City of Fayetteville, Arkansas, has amended the city building code for all existing and proposed construction and all land filling and excavation operations lying within and below the projected 100-year frequency flood plain elevation. Included are regulations concerning construction of and additions, repairs, or alterations to existing residential and non-residential structures. These provisions regulate floor elevation, flood proofing, and construction design, materials, and methods. For example, water supply systems and sanitary sewer systems shall be designed to minimize infiltration of flood waters or discharge into flood waters. With respect to subdivisions or other new developments, proposals shall be consistent with the need to minimize flood damage; public utility facilities shall be located and constructed to minimize or eliminate flood damage; and adequate drainage shall be provided. No land use, including land fill and excavation, may be permitted within the flood plain area unless it is demonstrated that such use, combined with all other existing and anticipated uses, will not increase the surface elevation of the 100-year flood more than one foot at any point. Within the flood plain area, laws and ordinances concerning land use and flood damage reduction shall take precedence over any conflicting law, ordinance, or code. (Schilling-Florida)
W76-05238

PROPOSED FLOODPLAIN REGULATIONS FOR THE GREATER ANCHORAGE AREA BOROUGH.
Greater Anchorage Area Borough, Alaska. Planning Dept.
Proposed Floodplain Regulations, May, 1972. 33 p.

Descriptors: *Alaska, *Local governments, :Legislation, *Floods, *Flood plain zoning, Water law, Legal aspects, Regulation, Governments, Waterproofing, Flood plains, Floodproofing, Flood control, Flood damage, Floodwater, Flood protection, Building codes, Maximum probable Flood, Permits.
Identifiers: Fill permits.

This ordinance applies to all lands which are located within the boundaries of the 100-year flood within the Greater Anchorage Area Borough. This area is designated the Flood Hazard District. Within the Flood Hazard District, uses involving structures, fill, or storage yards are permitted only upon the issuance of a special land hazard permit. Procedures for the issuance of such permits, as well as the factors upon which the issuance decision shall be based, are included in this ordinance. No use may be permitted which will substantially increase flood heights. To deposit fill in the flood hazard district, it must be shown that it is the minimum amount necessary, and that adequate precautions are taken to prevent erosion. Structures shall be designed to have a low flood damage potential, and shall be constructed, located, and anchored incompliance with this ordinance. Storage or processing of unanchored buoyant materials, or materials that are flammable, explosive, or dangerous to life in times of flooding is prohibited. Structures or uses which do not conform to this ordinance may be continued under conditions set forth in this ordinance. Variances from the provisions of this ordinance may be granted under certain circumstances. (Schilling-Florida)
W76-05239

PROPOSED PENNSYLVANIA FLOOD DISASTER PREVENTION ACT.
Pennsylvania, General Assembly, Harrisburg, Senate Bill No. 1 (1975).31 p.

Descriptors: *Pennsylvania, *Legislation, *Flood control, *Flood plain zoning, *Standards, Legal aspects, Law enforcement, Penalties(Legal), Permits, Regulation, Water law, State governments, Local governments, Flood protection, Water policy, Water management(Applied), Land use, Land development, Land resources, Water resources, Water utilization, Building codes, Floods,Water resources development.
Identifiers: *Pennsylvania Flood Disaster Prevention Act, Administrative regulations.

This proposed bill provides for the regulation of land and water use for flood control purposes, imposes duties and confers powers on various state administrative departments, provides for enforcement and penalties, and makes an appropriation. After a 'definition of terms' section, the Act provides that the Environmental Quality Board shall have the power to adopt regulations to require comprehensive flood area management and to establish minimum standards for delineation of flood areas. Representative provisions include: (1) design, construction and maintenance standards for obstructions within each flood area zone; (2) procedures for issuance of flood area construction permits; and (3) designation by municipalities of the county or regional planning agency as its agent for the development of the flood area management plan. Other sections provide for inter-agency cooperation, advisory consultative services, publication of results, and assessment of penalties. Finally, the Department of Community Affairs is authorized to administer grants to municipalities and counties to assist or reimburse them for costs incurred in complying with this bill. (Nursey-Florida).
W76-05241

SAMPLE ZONING REGULATIONS FOR THE MANAGEMENT OF FLOOD HAZARD AREAS.
Regulations of the Vermont Agency of Environmental Conservation, Montpelier, (1974). 17 p 2 fig, 1 apend.

Descriptors: *Vermont, *Legislation, *Flood control, *Flood protection, Construction, Legal aspects, Floodways, Flood plain zoning, Floods, Flood damage, Water management(Applied), Water law, Local governments, Regulation, Building Codes, Water resources, Water resources development, Water supply, Drainage systems, Land, Land use, Land development.
Identifiers: *National Flood Insurance Program, *Flood hazard areas.

As part of its program encouraging local governments to manage flood prone lands so as to qualify for federal flood insurance, the General Assembly of Vermont has provided sample zoning regulations, representative provisions of which include: (1) no land development is allowed within a flood hazard area without the approval of the Board of Adjustment (2) residential buildings in the floodway fringe must have the lowest floor elevated to at least one foot above the 100-year flood level; (3) non-residential buildings within the floodway fringe must have the lowest floor elevated or floodproofed to at least one foot above the 100-year flood level; (4)structures must be designed and anchored to prevent flotation, collapse or lateral movement; (5) water supply and sewage systems must be designed and located to avoid impairment or contamination during flooding; (6) junkyards and solid waste disposal sites are not permitted within a flood hazard area; (7) buildings and uses which existed prior to the effective date of this regulation may be continued indefinitely but shall not be altered without the approval of the planning commission and (8) permits authorized under this regulation may be appealed by interested parties. Addenda to the sample regulations include an illustration of definitions for flood hazard areas. (Nursey-Florida)
W76-05242

FLOOD PLAIN INFORMATION: FARMINGTON AND CONNECTICUT RIVERS, WINDSOR, CONNECTICUT.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-05256

FLOOD PLAIN INFORMATION: WEST BRANCH DUPAGE RIVER, KRESS CREEK, AND KLEIN CREEK, DUPAGE COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-05257

SPECIAL FLOOD HAZARD INFORMATION: DUNN BRANCH, WOODBINE, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-05258

THE TRI-STATE COASTAL ZONE MANAGEMENT PERSPECTIVES.
Tri-State Regional Planning Commission, New York.
For primary bibliographic entry see Field 6G.
W76-05260

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND WILD HORSE CREEK, HOLLY, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-05262

FLOOD PROOFING DECISIONS UNDER UNCERTAINTY,
Massachusetts Univ., Amherst Dept. of Agricultural and Food Economics.
C. E. Willis, and P. Aklilu.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 045, $3.50 in paper copy, $2.25 in microfiche. (1974) 15 p. 2 fig, 1 tab, 19 ref.OWRT B-028-MASS (2).

Descriptors: *Risks, *Decision making, *Floodproofing, Methodology, Flood protection, Cost-benefit analysis, Estimating, *Connecticut, *Connecticut River.
Identifiers: Windsor(Conn).

A formulation for estimating the economic efficiency of flood proofing in a partial equilibrium context for specific communities in the Connecticut River Basin is developed. The advantages of explicitly incorporating uncertainty factors into the analysis are discussed and illustrated empirically. Incorporating risk factors into the decision making process, while requiring more complicated procedures, yields more correct and less ambiguous results. Applying the expectation-variance framework to the case of the Windsor, Connecticut community, the recommend decision is to floodproof structures to a height of four feet when the discount rate is 5% over fifty years and the increased expected benefits are at least 3.4 times as valuable as reduced standard deviation of net benefits. Major limitations of the method include assuming that benefits or damage reductions and flood proofing costs are linear in terms of the depth of the flood, and assuming that the only alternatives are to flood proof to various levels or do nothing, rather than considering a mix of structural and non-structural measures. (Luedtke-Wisconsin)
W76-05456

6G. Ecologic Impact Of Water Development

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 3, ESTUARINE WATER QUALITY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05005

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 5, ESTUARINE BIOLOGY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05006

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 7, POLICY AND REGULATORY DIMENSIONS,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05007

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 9, PRINCIPLES OF ECOSYSTEM MANAGEMENT,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05008

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 10, GROWTH AND LAND USE, STUDY NO. 11, ECONOMIC IMPLICATIONS OF LAND DEVELOPMENT ALTERNATIVES, STUDY NO. 12, A SIMULATION MODELING APPROACH TO THE STUDY OF DEVELOPMENT ALTERNATIVES,
For primary bibliographic entry see Field 5G.
W76-05009

CRITERIA FOR THE ECOLOGICAL EVALUATION OF THE LOWER MAIN RIVER, (IN GERMAN),
Natur-Museum und Forschungs-Institut Senchkenber, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5B.
W76-05057

THE ENVIRONMENTAL IMPACT OF AN OFFSHORE OIL SPILL,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5C.
W76-05148

PROTECTING PUBLIC HEALTH FROM HAZARDOUS SUBSTANCES: FEDERAL REGULATION OF ENVIRONMENTAL CONTAMINANTS,
Environmental Law Inst. Washington, D.C.
M. L. Karstadt.
Environmental Law Reporter, Vol. 5, No. 9, p. 50165-50178 (1975), 14 p.

Descriptors: *Regulation, *Public health, *Hazards, *Pollutants, *Water quality control, Legal aspects, Federal government, Judicial decisions, Organizations, Diseases, Toxicity, Industrial wastes, Pesticide residues, Water pollution sources, Water pollution effects, Water pollution control, Air pollution, Potable water, Legislation, Legal review, Water law, Industries, Wastes.
Identifiers: Administrative regulations, Hazardous substances.

Protection of the public from possible harm caused by the release of hazardous substances into the environment is largely the responsibility of various federal regulatory agencies whose decisions are often hampered by insufficient data. When a possible public health threat arises, coupled with an incomplete data base, regulators must be biased in favor of measures which will reduce exposure of humans to potentially hazardous substances. The problems faced by regulators in the field of environmental health regulation are exacerbated by the fact that many courts will not uphold regulations prohibiting the use of potentially hazardous substances unless a substantial threat of harm to public health can be shown. Since most scientific data is accumulated through tests on animals and there is rarely human data available, it is often extremely difficult to show the substantial threat of harm required. With the rapid pace of technological innovation in American society, the only possible solution to the problem may be to require industry to bear the burden of demonstrating the safety of its new products and processes before significant human exposure occurs. (Nursey-Florida)
W76-05185

ENVIRONMENTAL PROTECTION AND THE ROLE OF THE CIVIL MONEY PENALTY: SOME PRACTICAL AND LEGAL CONSIDERATIONS,
D. W. Marshall.
Environmental Affirs, Vol. 4 p. 323-366 (1975), 44 p.

Descriptors: *Costs, *Industries, *Penalties(Legal), *Water pollution control, *Law enforcement, Environmental effects, Legal aspects, Judicial decisions, Legislation, State governments, Federal government, Governments, Pollutants, Negligence, Regulation, Water law, Economics, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality, Water quality control, Constitutional law.
Identifiers: *Civil money penalties, Environmental policy, Injunctive relief.

Injunctions possess negligible deterrent value in the enforcement of environmental legislation. And while criminal sanctions may be an effective deterrent to wilful violations of environmental laws they are inappropriate for the bulk of environmental violations, which are often due to negligence. Thus the civil money penalty fills a great need by operating as an effective general deterrent to environmental law violations. The civil penalty has for its major premise that, where the penalty is greater than the polluter's cost of abatement, the polluter will choose to comply with the law rather than pay the penalty. The penalty is thus designed to reduce environmental pollution, not to punish violators. To assure its effectiveness, the civil penalty must be administered in a manner calculated to achieve maximum flexibility, with measures tailored to fit the particular situation. (Nursey-Florida)
W76-05188

ENVIRONMENTAL PROTECTION IN CALIFORNIA: COURT ACTION POWERS OF STATE AND LOCAL GOVERNMENT ATTORNEYS,
J. P. Wagner.
Santa Clara Lawyer, Vol. 14, p. 296-324 (1974), 29 p.

Descriptors: *California, *Law enforcement, *State governments, *Local government, *Pollution abatement, Legal aspects, Air pollution, Air pollution effects, Water pollution, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality, Water quality control, Pollutants, Public health, Governments, Governmental interrelations, Penalties(Legal), Environmental effects, State jurisdiction, Legislation, Judicial decisions, Water law.
Identifiers: *California Water Code, California Health and Safety Code, Nuisance(Legal aspect), Injunctive relief.

The California Attorney General possesses powers through his representation of state agencies, his involvement in state legal matters and his control over actions involving counties to bring

vironmental protection actions in the courts. Local government attorneys, however, have only limited powers in relatively few areas. These include certain powers derived from the representation of local agencies and districts, and the power to abate nuisances. They also possess some statutory air pollution control powers. If environmental protection is to be meaningful, the powers of local government attorneys must be greatly expanded nd traditional equity requirements for injunctive relief greatly modified. (Nursey-Florida)
W76-05189

ENVIRONMENTAL CLASS ACTIONS IN THE FEDERAL COURTS - PEERING THROUGH THE ZAHN SMOG,
For primary bibliographic entry see Field 6E.
W76-05190

PERSPECTIVES ON THE ARMY ENGINEERS WATER MANAGEMENT MISSION,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-05211

MONTANA ENVIRONMENTAL POLICY ACT,
Montana Environmental Quality Council, Helena.
For primary bibliographic entry see Field 6E.
W76-05218

FEDERAL LEGISLATION AND COMMON LAW ASPECTS OF ENVIRONMENTAL PROBLEMS IN CANADA,
Atlantic Richfield Canada Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 6E.
W76-05231

THE TRI-STATE COASTAL ZONE MANAGEMENT PERSPECTIVES.
Tri-State Regional Planning Commission, New York.
April 1975. 48 p 15 fig, 18 tab.

Descriptors: *Harbors, *Land use, *Shore protection, *Planning, *Area redevelopment, Rivers, Environmental effects, Water treatment, Projections, Recreation, Waste disposal, Hudson River, and management, Connecticut, New York, New Jersey.
Identifiers: Shipping, *Coastal zone management.

The goal of management in this region, composed the states of CT, NJ and NY, is to accommodate the economic, cultural and leisure needs of people requiring location in the coastal zone to restore or enhance the natural character and actions of the zone. The report covers the status this water-related area at present and problems perspectives concerning the marine complex, reation, power generation, shipping, waste posal, land development, and managing the e. The zone, which stretches over 1200 miles, a significant amount of residential, nonresential and recreation land uses as well as extenharborfront which is making the transition n purely industrial uses. Almost 40% of the e is still open and even the harbor is 1/3 unveloped or in transition. Four strategies are mmended: establish strict site regulations for vities seeking location in the zone; reserve cerareas for heavy uses that need water-oriented tion such as shipping, sewage treatment and er generation; encourage the combination of eation, open space, scenic amenity, etc., with essary economic 'heavy' uses; and set environtal tolerance standards. An administrative hanism should be set up that can administer lations, control development, resolve cons, and acquire land and water. Statistics are n on the various areas of concern. Considera are broad. For example, with regard to power ration energy sources such as the sun, fuel , nuclear fusion, geothermal energy and wind er are considered. (Smith-North Carolina)
W76-05260

STRATEGY OF BIOLOGICAL MONITORING, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-05301

ENVIRONMENTAL ANALYSIS OF WATER RESOURCES DEVELOPMENT IN SOUTHWESTERN NORTH DAKOTA,
Dickinson State Coll., N. Dak.
E. R. Logan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 887, $5.00 in paper copy, $2.25 in microfiche. OWRT-A-041-NDAK (3) 14-31-0001-4034 5034 North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-221-034-76, February 1976. Part II, 86 p, 27 tab, append.

Descriptors: *North Dakota, Water resources development, *Vegetation, Plant groupings, *Bird types, *Fish types, *Mammal groupings, Environment.
Identifiers: Southwestern North Dakota.

A total of 20 vegetative community types were identified. Abstracts of the community descriptions are included. The abstracts are from published, unpublished and observational data. The community types included gravel bottom, mud bottom, submergent, floating leaved, reed swamp, sedge-meadow, sloughgrass, switchgrass-Canada wildrye, big bluestem, willow-cottonwood, wolfberry-rose-bromegrass, elm-boxelder, sagebrush, buffaloberry, green ash, aspen, juniper, ponderosa pine, salt desert shrub and sand dune. Total of 109 bird species were identified. Seventeen mammal species were observed and identified as well as several fish species. (See also W76-05350 and W76-05352)
W76-05351

THE SOCIAL WELL-BEING AND QUALITY OF LIFE DIMENSION IN WATER RESOURCES PLANNING AND DEVELOPMENT.
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W76-05354

WESTERNPORT BAY ENVIRONMENTAL STUDY 1973-1974.
Victoria Ministry for Conservation, Melbourne (Australia). Westernport Bay Environmental Study.
1975. 647 p.

Descriptors: *Baseline studies, *Regional development, *Environmental effects, *Australia, *Bays, Estuaries, Watersheds(Basins), Economic impact, Social impact, Wildlife habitats, Recreation facilities, Comprehensive planning, Water quality, Land use, Model studies.
Identifiers: *Westernport Bay(Vic.).

The Westernport Bay area of southern Victoria (Australia) provides an important wildlife habitat and recreation facility; it also has features desirable for industrial port development. The Westernport Bay Environmental Study was initially a two-year study to develop guidelines for the future management of the area based on fundamental and extensive understanding of its physical, chemical, biological, social and economic characteristics. The first major report summarises the results of all projects within the Study and provides preliminary guidelines. It also places emphasis on the methodology developed for a multi-disciplinary approach to a complex environmental problem, particularly the incorporation of Water Quality and Land Activities models. (CSIRO)
W76-05404

A METHOD FOR APPLYING RESEARCH TO ENVIRONMENTAL PLANNING AND MANAGEMENT: A CASE STUDY OF ISSUES IMPORTANT TO THE CHESAPEAKE BAY REGION,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W76-05434

7. RESOURCES DATA

7A. Network Design

COMPARISON OF ELECTROMAGNETIC AND SEISMIC-GRAVITY ICE THICKNESS MEASUREMENTS IN EAST ANTARCTICA,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05382

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
For primary bibliographic entry see Field 5C.
W76-05405

7B. Data Acquisition

BIG-METER TESTING PROGRAM BOOSTS WATER REVENUES.
For primary bibliographic entry see Field 6C.
W76-05060

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Nebraska Univ. Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-05179

SYMPOSIUM ON REMOTE SENSING IN GLACIOLOGY.
International Glaciological Society, Cambridge (England).
For primary bibliographic entry see Field 2C.
W76-05372

THE ELECTRICAL PROPERTIES OF SNOW AND ICE,
Birmingham Univ. (England). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W76-05373

RADIO-ECHO SOUNDING: GLACIOLOGICAL INTERPRETATIONS AND APPLICATIONS,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 2C.
W76-05375

THEORY OF RADIO FROM GLACIER BEDS,
Bristol Univ. (England). H. H. Wills Physics Lab.
For primary bibliographic entry see Field 2C.
W76-05376

INVESTIGATIONS OF SUB-ICE BEDROCK CHARACTERISTICS BY RADIO-ECHO SOUNDING,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 2C.
W76-05377

GLACIER SLIDING MEASURED BY A RADIO-ECHO TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
British Antarctic Survey, London (England).
For primary bibliographic entry see Field 2C.
W76-05378

LAYER ECHOES IN POLAR ICE SHEETS,
Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
For primary bibliographic entry see Field 2C.
W76-05379

RADIO-ECHO SOUNDING OF THE LAMBERT GLACIER BASIN,
Department of Sciences, Melbourne (Australia). Antarctic Div.
For primary bibliographic entry see Field 2C.
W76-05380

ADVANCES IN GEOPHYSICAL EXPLORATION OF ICE SHEETS AND GLACIERS,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics; Wisconsin Univ., Madison. Geophysical and Polar Research Center.
For primary bibliographic entry see Field 2C.
W76-05381

COMPARISON OF ELECTROMAGNETIC AND SEISMIC-GRAVITY ICE THICKNESS MEASUREMENTS IN EAST ANTARCTICA,
Scott Polar Research Inst., Cambridge (England).
D. J. Drewry.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 137-150, 197. 2 fig, 10 tab, 41 ref.

Descriptors: *Glaciers, *Ice, *Measurement, *Antarctic, On-site investigations, Seismic studies, Gravity studies, Remote sensing, Radar, Navigation, Sounding, Borehole geophysics, Glaciology.
Identifiers: *Radio-echo soundings, *Ice thickness.

The errors involved in ice thickness determinations in Antarctica by seismic reflection shooting, gravity observations, and radio-echo sounding were briefly discussed. Relative accuracies of 3%, 7-10% and 1.5% have been suggested. Double checks of ice depths from radar sounding in east Antarctica indicated an internal consistency of measurement for this technique of less than 1%. Comparison of carefully executed seismic shooting and routine radio-echo sounding results against absolute ice thickness values from two deep core drilling sites showed no significant differences between these two remote methods (i.e., both are better than 1.5%). Over 60 comparisons were examined between radar ice thicknesses and over-snow measurements obtained on 8 independent traverses in east Antarctica. Three traverses exhibited consistently unacceptable results--U.S. Victoria Land Traverse II (southern leg), Commonwealth Transantarctic Expedition, and the U.S.S.R. Vostok to South Pole Traverse--which probably resulted from misinterpretation of 'noisy' seismograms. The remaining comparisons indicated mean differences, including some navigational uncertainty, of about 3% less than 8%, and 5% between radio-echo and (1) seismic, (2) gravity, and (3) gravity tied to seismic determinations, respectively. (See also W76-05372) (Sims - ISWS)
W76-05382

VELOCITY OF RADIO WAVES IN ICE BY MEANS OF A BORE-HOLE INTERFEROMETRIC TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
G. de Q. Robin.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 151-159, 1975. 4 fig, 2 tab, 16 ref.

Descriptors: *Ice, *Electrical properties, *Radio waves, *Velocity, Firn, Electronic equipment, On-site investigations, Borehole geophysics, Measurement, Glaciers, Glaciology.

Radio waves of fixed frequency, which had passed through ice and firn from a transmitting antenna lowered down a bore hole, were monitored on the surface. By mixing the received signal with the fixed frequency, the beats which were produced as the antenna was lowered gave a value for the wavelength in ice at the depth of the antenna. This was multiplied by the frquency to give the velocity of radio waves in ice. Measurements averaged over 10 m and longer intervals were related to density values from bore holes in the same location. Results above 50 m were difficult to interpret, but at greater depths the velocities fitted a linear relationship between refractive index and density. A small extrapolation gave a velocity of radio waves in pure ice of 167.7 + or - 0.3 m/micro-second at -20 C. (See also W76-05372) (Sims -ISWS)
W76-05383

APPLICATION OF RADAR TECHNIQUES TO ICE AND SNOW STUDIES,
Communications Research Centre, Ottawa (Ontario).
D. F. Page, and R. O. Ramseier.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge(England), September 16-20, 1974. Journal of GLaciology, Vol 15, No 73, p171-191, 1975. 13 fig, 45 ref.

Descriptors: *Ice, *Snow, *Measurement, *Remote sensing, *Radar, Sounding, Electrical properties, Equipment, Electronic equipment, Glaciers, Glacilogy.
Identifiers: *Side-looking radar, Floating ice.

This paper presents an overview of the active microwave tools becoming available to the glaciologist with emphasis on recent radar developments as applied to floating ice. Sufficient theory is presented for the user to understand the techniques. Side-looking radar imagery is discussed using a number of examples resulting from the use of real and synthetic aperture, single and dual polarization. Recent studies of the microwave properties of ice and snow are reviewed, and are shown to be leading to significant advances in high-resolution radar techniques for accurate sounding of these materials. Remote sensing of fresh-water ice thickness is shown to be well established and operational, with smilar techniques feasible in the near future for sea ice. It is pointed out that both imaging and probing radars applied to studies of sea ice and snow usually must be used in association with data from other sensors. (See also W76-05372) (Sims - ISWS)
W76-05385

INTERPRETATION OF SLAR IMAGERY OF SEA ICE IN NARES STRAIT AND THE ARCTIC OCEAN,
Defence Research Establishment, Ottawa (Ontario).
M. Dunbar.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 193-213, 1975. 15 fig, 10 ref.

Descriptors: *Sea ice, *Arctic, *Radar, *Remote sensing, Aircraft, Surveys, Ice, Ice cover, Equipment, Electronic equipment.
Identifiers: *Nares Strait, *Side-looking radar, Photo interpretation.

Sideways-looking airborne radar (SLAR) imagery of Nares Strait was obtained on three flights carried out in January, March, and August of 1973 by Canadian Forces Maritime Proving and Evaluation Unit in an Argus aircraft equipped with a Motorola APS-94D SLAR; the March flight also covered two lines in the Arctic Ocean, from Alert to the North Pole and from the Pole down the long. 4 deg E. meridian to the ice edge at about lat. 80 deg N. No observations on the ground were possible, but some back-up was available on all flights from visual observations recorded in the air, and on the March flight from infrared line-scan and vertical photography. The interpretation of ice features from the SLAR imagery was discussed, and it was concluded that in spite of certain ambiguities the technique has great potential which will increase with improving resolution. Extent of coverage per distance flown and independence of light and cloud conditions make it unique among airborne sensors. (See also W76-05372) (Sims-ISWS)
W76-05386

SEA-ICE RECONNAISSANCE BY RADAR,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
T. Tabata.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 197... Journal of Glaciology, Vol. 15, No. 73, p 215-22... 1975. 9 fig, 10 ref.

Descriptors: *Sea ice, *Radar, *Remote sensing, *Data processing, Movement, Coasts, Ice, Ice cover, Surveys, Computers, Equipment, Electronic equipment.
Identifiers: *Japan, *Hokkaido(Japan).

To observe the distribution of pack ice off the coast of the Okhotsk Sea coast of Hokkaido, a radar network consisting of three radar stations was constructed during 1967-69. It covers an area about 70 km wide and 250 km long. The stations are remote-controlled by radio from the Sea Ice Research Laboratory and the information obtained is transmitted back to the laboratory and observed there. Radar has the great advantage of being able to make continuous observations of ice. Usually several special features can be seen on the radar screen, and they are used as markers for the observation of movement. It is ascertained that the average pattern of drift in this area is from north to south-east along the coast line and the ice field undergoes internal deformation during its drift. To get some information on the surface topography of ice from A-scope radar, the intensity of echo signals is classified into 16 steps by computer. To obtain the movement of an ice field from the numerical radar information, a modified two-dimensional cross-correlation method was tested. (See also W76-05372) (Sims-ISWS)
W76-05387

COMPARISON OF SEA-ICE TYPE IDENTIFICATION BETWEEN AIRBORNE DUAL-FREQUENCY PASSIVE MICROWAVE RADIOMETRY AND STANDARD LASER/INFRARED TECHNIQUE,
Naval Oceanographic Office, Washington, D.C.
S. G. Tooma, R. A. Mennella, J. P. Hollinger, and R. D. Ketchum Jr.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1... Journal of Glaciology, Vol. 15, No. 73, p 225-... 1975. 11 fig, 8 ref.

Descriptors: *Sea ice, *Remote sens... *Instrumentation, Aircraft, Ice, Arctic, Co... Infrared radiation, Microwaves, Measurem... Equipment.
Identifiers: *Greenland, Radiometers, L... profilers.

uring December 1973, the Naval Oceanographic ffice (NAVOCEANO) and the Naval Research aboratory (NRL) conducted a joint remote-ensing experiment over the sea-ice fields off coresby Sound on the east coast of Greenland ing NAVOCEANO's RP3-A Birdseye aircraft, ser profiler, and infrared scanner, and NRL's 19- and 31.0 GHz nadir-looking radiometers. The jectives of this mission were: (1) to develop ills for interpreting sea-ice passive microwave ta; (2) to expand, if possible, the two-category pability (multi-year ice and first-year ice) of pas-ve microwave sensors over sea ice; (3) to com-re two frequences (19 and 31 GHz) to determine ich may be more useful in a scanning radiome- now under development at NRL; and (4) to termine the value of multi-frequency as com-red to single-frequency study of sea ice. Five ice nditions - open water/new ice, smooth first-year , ridged first-year ice, multi-year ice, and a her brightness temperature form of multi-year interpreted as second-year ice - were identifia-, regardless of weather conditions, by compar-the average of the two microwave brightness nperatures at the two frequencies with their dif-ence. (See also W76-05372) (Sims-ISWS)
'6-05388

MPERATURE MEASUREMENT OF ICE AND ATER SURFACES IN THE NORTH WATER EA USING AN AIRBORNE RADIATION ERMOMETER,
genossische Technische Hochshule, Zurich itzerland). Geographisches Institut.
Muller, H. Blatter, and G. Kappenberger.
Symposium on Remote Sensing in Glaciology; ceedings of the third symposium on glaciology, nbridge (England), September 16-20, 1974. rnal of Glaciology, Vol. 15, No. 73, p 241-250, 5. 12 fig, 3 tab, 6 ref.

criptors: *Sea ice, *Water, *Temperature, mote sensing, Infrared radiation, Measure-t, Equipment, On-site data collections, Air-t, Data processing, Analytical techniques.
ntifiers: *Baffin Bay, Radiometers.

and water surface temperatures were mea-d with an airborne radiation thermometer -5 over the North Water polynya during three sions between late winter and early summer . Error corrections, problems of data yses, and mapping were discussed. Attempts e made to relate the main types of sea ice to perature ranges, which then were used in con-tion with satellite pictures to produce surface perature maps. (See also W76-05372) (Sims-S)
-05389

ANALYSIS OF THE NEAR-SURFACE RGY TRANSFER ENVIRONMENT FROM RMAL INFRARED IMAGERY,
igan Univ., Ann Arbor. Dept. of Geography.
Outcalt.
ymposium on Remote Sensing in Glaciology; edings of the third symposium on glaciology, ridge (England), September 16-20, 1974. al of Glaciology, Vol. 15, No. 73, p 267-276, 5 fig, 2 tab, 21 ref.

riptors: *Energy transfer, *Remote sensing, ared radiation, *Alaska, Ice, Glaciers, Sea Snow, Radiation, Thermal radiation, Heat fer, Aircraft, Equipment, Mapping, Glaciolo-

fiers: *Thermal mapping, Radiometers.

adiant surface temperature imaged by ther-frared line-scanning equipment is a product th surface temperature and emissivity. In it is the integrated product of evolutionary opment of the near-surface energy transfer e. The variation of surface radiant tempra-patially and temporally contains information the structure, composition, and thermal state of near surface materials. It was suggested that the study of ground ice, sea/lake ice, and the thermal regimes of mountain snow and ice bodies, are reasonable targets for the quantitative application of thermal mapping technology, and that considerable technical development effort be expended on spectral, spatial, and temporal operators for use in computer processing of pictures for glaciological data. (See also W76-05372) (Sims-ISWS)
W76-05390

SIGNIFICANCE OF SURFACE TEMPERATURE IN THE THERMAL INFRARED SENSING OF SEA AND LAKE ICE,
Army Engineer Topographic Labs., Fort Belvoir, Va. Center for Remote Sensing.
A. O. Poulin.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 277-283, 1975. 3 fig, 9 ref.

Descriptors: *Sea ice, *Remote sensing, *Temperature, Radiation, Infrared radiation, Snow, Thermal radiation, Thermal conductivity, *Lake ice, Snow cover, Heat flow.
Identifiers: *Thermal mapping, Radiometers, Surface temperature, Ice thickness, Snow depth.

Thermal infrared sensing can provide much information about sea ice, and some of the physical conditions associated with sea ice suggest that surface temperature may be a good indicator of ice thickness. However, steady-state heat-flow calculations suggest that the variable thickness of the snow cover and its low, variable thermal conductivity would preclude the use of surface temperature alone as a suitable indicator of ice thickness. Measurement of surface temperature, snow depth, and ice thickness suggest that, in an area of relatively uniform ice thickness, surface temperature might be useful as an indicator of snow depth if some surface data can be obtained. (See also W76-05372) (Sims-ISWS)
W76-05391

SEASONAL EFFECTS ON GROUND-WAVE PROPAGATION IN COLD REGIONS,
Research Inst. of National Defence, Stockholm (Sweden).
A. Blomquist.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 285-303, 1975. 12 fig, 27 ref.

Descriptors: *Radio waves, *Cold regions, *Model studies, Mathematical models, On-site investigations, Conductivity, Soils, Frozen soils, Electric fields, Electrical properties, Radiation, Glaciology, Seasonal, Electrical engineering, *Seasonal.
Identifiers: *Ground-wave propagation, Dielectric constant.

The ground-wave is the most important mode of propagation of radio waves in connection with glaciology. In cold regions, special conditions are often prevalent, involving propagation over non-homogeneous earth, presence of stratified media, and low values of conductivity and dielectric constant in the upper strata. A radio wave which propagates along the Earth's surface is, however, also influenced by atmospheric refraction. As the frequency is increased, the roughness of the Earth's surface must also be taken into account. Thus seasonal variations are to be expected due to changes in the electrical and topographical properties of the ground as well as the propagation conditions in the atmosphere. It is, however, difficult to separate these various effects, a fact which reduces the possibility of using ground-wave propagation as a tool for obtaining information on the properties of the ground. In many practical cases of ground-wave propagation in arctic regions, the formula for the ground-wave field strength can be written in a very simple way. Such a propagation model for frequencies above 30 MHz was presented in which account is taken of the Earth's curvature, the terrain irregularities, and the effect of the tropospheric refraction. This model also included the recovery effect which occurs in propagation over mixed paths. (See also W76-05372) (Sims-ISWS)
W76-05392

CHARACTERIZATION OF COLD-REGIONS TERRAIN USING AIRBORNE LASER PROFILOMETRY,
Cold Regions Research and Engineering Lab., Hanover, N. H.
W. D. Hibler, III.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 329-347, 1975. 13 fig, 25 ref.

Descriptors: *Terrain analysis, *Sea ice, *Remote sensing, *Arctic, Cold regions, Ice, Aircraft, Equipment, Instrumentation, Data processing, Analytical techniques, Tundra.
Identifiers: *Laser profilers, *Sea-ice ridging.

A review was provided of the characteristics of airborne laser profilometry and its application to quantitative characterization of cold-regions terrain. The limitations of profilometry due to the profiler instrumental characteristics and instability of the aircraft platform were discussed. For typical aircraft speeds of the order of 100 m/s these limitations restrict the accurately measured roughness content to the approximate wavelength range 2 m to 300 m. Digital filtering and hardware techniques for removing the aircraft motion were discussed. Regarding terrain characterization, particular attention was given to Arctic sea ice. Ridge height and spacing distribution models for sea ice in conjunction with digitally processed laser profiles allow efficient characterization of sea-ice ridging using only a few parameters. In particular, a single ridging intensity parameter has been found to allow reasonable estimation of the number of ridges encountered at any height level along a straight-line path. Examination of spectral characteristics of first-year and multi-year ice suggested that laser profiles may be used to identify the ice type of floes and ridges. Comparisons of laser data and submarine sonar data were made which suggested that ratios of about 6.5 : 1 can be used to estimate ridge keel depths from laser data. (See also W76-05372) (Sims-ISWS)
W76-05393

A SUBMARINE SONAR STUDY OF ARCTIC PACK ICE,
Scott Polar Research Inst., Cambridge (England).
E. Williams, C. Swithinbank, and G. de Q. Robin.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 349-362, 1975. 12 fig, 5 tab, 5 ref.

Descriptors: *Sea ice, *Arctic Ocean, *Sonar, *Submarines, *Arctic, Ice, Measurement, Remote sensing, Acoustics, Sound waves, Oceans, Oceanography.
Identifiers: *Sea-ice thickness, Sea-ice draft, Sea-ice ridging.

A continuous profile of the Arctic Ocean ice canopy from Spitsbergen to the North Pole was made with 48 kHz echo sounders mounted on a nuclear submarine. A semi-automatic digitizer was used to measure coordinates from the records at a frequency of about 1,000 points per linear kilometer of track. Methods derived for the reconstruction of subglacial relief from 35 MHz radio-echo

sounding records were applied to eliminate part of the distortion due to the 20 deg beam width of the sounders. A corrected profile was used to obtain ice drafts at 2 m intervals. Data were analyzed in 10 km sections and figures were summarized for each degree of latitude. The results included: mean ice draft, percentage of ice less than 0.3 m draft, and percentage of level ice. Histograms showed the level ice drafts which occur most frequently, and these may indicate the ratio of first-year to older ice. The number of ice keels was listed together with their mean draft and draft distribution. Definitions were found to be of overriding importance in the comparison of data from different areas. (See also W76-05372) (Sims-ISWS)
W76-05394

SATELLITES--NEW GLOBAL OBSERVING TECHNIQUES FOR ICE AND SNOW,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
P. Gloersen, and V. V. Salomonson.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 373-389, 1975. 21 fig, 13 ref.

Descriptors: *Satellites(Articial), *Ice, *Snow, *Remote sensing, Glaciers, Snow cover, Sea ice, Ice cover, Snowmelt, Melt water, Runoff, Watersheds(Basins), Water resources, Hydrology.
Identifiers: *ERTS, Nimbus satellites.

The capabilities of satellite observations for assessing snow and ice resources on Earth have been greatly improved through the utilization of higher resolution imaging systems and multispectral images in the wavelength range from 0.4 micrometer to 1.55cm. The possibility that the variation in areal extent of the snow cover may be related by empirical means to the average monthly run-off in a given watershed was demonstrated by comparing run-off records from the Indus River Basin in southeast Asia with a series of snow-cover maps obtained from Nimbus-3 and 4 imagery. Similar studies using the higher spatial resolution available with ERTS-I imagery were carried out for the Wind River Mountains watersheds in Wyoming, where it was found that the empirical relationship varied with mean elevation of the watershed. In addition, digital image-enhancement techniques were shown to be useful for identifying glacier features thought to be related to extent of snow cover, moraine characteristics, debris coverage, and the like. Finally, longer wavelength observations using sensors on board the Nimbus-5 satellite were shown to be useful for indicating crystal size distributions and onset of melting on glacier snow cover. (See also W76-05372) (Sims - ISWS)
W76-05396

ERTS DATA IN GLACIOLOGY--AN EFFORT TO MONITOR GLACIER MASS BALANCE FROM SATELLITE IMAGERY,
Norges Vassdrags- og Elektrisitetsvesen, Oslo.
G. Ostrem.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 403-415, 1975. 10 fig, 6 ref.

Descriptors: *Remote sensing, *Glaciers, *Hydroelectric plants, *Satellites(Artifical), Aerial photography, Snow cover, Ice, Runoff, Snowmelt, Snow surveys, Snowpacks, Data processing.
Identifiers: *ERTS data, *Norway, *Glacier mass balance.

Due to increased demand for electric energy, which in Norway is produced almost entirely by hydro-electric power plants, extensive glacierized basins are now considered for future power production. However, glacier behavior has a great impact on the annual run-off from these basins, and information about expected annual deviations from a 'normal' discharge must be obtained from mass-balance studies on representative glaciers within the basin. For this reason such studies are presently performed at eight selected Norwegian glaciers. The transient snow line can be identified easily on conventional air photographs and its height determined by direct comparisons with reliable topographic maps (with contour lines on glaciers). The resolution in ERTS images is sufficiently good to use the satellite data for a similar height determination of the transient snow line on glaciers--at least on the larger valley glaciers and, of course, on ice caps. Due to an existing correlation between the height of the transient snow line (at the end of the melt season) and the annual specific net mass balance, it is possible to construct a diagram expressing this relationship, provided detailed mass-balance studies have been performed during a period of several years of different mass-balance conditions. (See also W76-05372) (Sims - ISWS)
W76-05397

ANTARCTIC SEA-ICE VARIATIONS FROM SATELLITE SENSING IN RELATION TO CLIMATE,
Department of Science, Melbourne (Australia). Antarctic Div.
W. F. Budd.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 417-427, 1975. 7 fig, 22 ref, 1 append.

Descriptors: *Antarctic, *Sea ice, *Remote sensing, *Satellites(Artificial), Temperature, Ice cover, Polar regions, Climates, Climatology.

An analysis of records of annual mean temperatures around Antarctica shows large-scale anomalies of thousands of kilometers extent with typical variations of 2 deg from one year to another. From 1967 on, composite satellite photographs are available which show considerable variation in the sea-ice extent in different years up to about 5 deg of latitude. These largest differences seem to persist over entire seasons. In general there seems to be considerable association between the region around the Antarctic with the coldest temperatures and the regions of greatest sea-ice extent. An analysis of long-term records at a single location near the edge of the Antarctic sea ice indicated a strong correlation between variations in the annual mean temperature and the duration of the sea ice, such that a change 1 deg in the annual mean temperature corresponds to about 70 d variation in the duration of the sea ice. A relation was obtained between variations of annual mean temperature and the mean extent of the sea ice, namely, a 1 deg change corresponds to approximately 2.5 deg latitude variation in the maximum sea-ice extent. The magnitude of the variations in the sea-ice extent observed from the satellite data in comparison with the large-scale temperature anomalies was compatible with the above relations, although some rotational shifts appear to take place. (See also W76-05372) (Sims - ISWS)
W76-05398

THE USE OF ERTS PHOTOGRAPHS TO MEASURE THE MOVEMENT AND DEFORMATION OF SEA ICE,
Bristol Univ. (England). H. H. Wills Physics Lab.
J. F. Nye.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 429-436, 1975. 3 fig, 7 ref.

Descriptors: *Sea ice, *Antarctic, *Remote sensing, *Movement, *Deformation, Strain Satellites(Artificial), Ice, Ice cover, Polar regions, Photography, Model studies, Mathematical models.
Identifiers: *ERTS.

Is it justified to adopt a two-dimensional con tinuum model for the movement and large-scal deformation of pack ice. A preliminary study o ERTS-I photography showed that the details o the ice movement are readily measurable; th problem is not in the accuracy of the remot sensing but in the inherent graininess of the se ice. There is a spatial variation of ice velocity on scale of several hundreds of kilometers; smalle scale variations are superimposed on this, but the amplitude is not enough to obscure the large-sca trend. A continuum model is applicable, bu because of the small-scale variations in th velocity of the sea ice itself, it is not meaningful specify continuum strain-rates on a scale of, sa 100 km to more than a certain accuracy. If ERT pictures are available during the AIDJEX main e periment, they could provide the necessary stra and displacement measurements for comparis with the predictions of the AIDJEX model. (S also W76-05372) (Sims - ISWS)
W76-05399

GENERAL DISCUSSION, THE STATE OF TH ART--AND WHERE DO WE GO FROM HERE
For primary bibliographic entry see Field 2C.
W76-05400

EXPERIMENTAL DETERMINATION OF SO MOISTURE ON IRRIGATED LANDS FRO RADIOACTIVE SOIL EMISSION,
For primary bibliographic entry see Field 2G.
W76-05401

A NOTE ON THE USE OF THE PHILIP INF TRATION EQUATION,
Commonwealth Scientific and Industrial Resea Organization, Canberra (Australia). Div. of vironmental Mechanics.
For primary bibliographic entry see Field 2G.
W76-05411

REMOTE SENSING,
Geological Survey, Reston, Va.
A. N. Kover.
Geotimes, Vol 21, No 1, p 35-36, January 1976.

Descriptors: *Data collections, *Hydrol *Remote sensing, *Satellites(Artific *Networks, Snowpacks, Runoff, Forecas Glaciers, Movement, *Mapping, Geol Mineralogy.
Identifiers: *LANDSAT data.

Landsat data have proved adequate for map snowpack in forecasting runoff. However, data are required within 2 to 3 days to m productive rather than retrospective forec Landsat imagery has been effective in monit the movement of glaciers and in mapping su glaciers in Iceland, Alaska, and other areas. extent of flooding has been mapped in man gions. Data Collection Platforms (DCP) demonstrated the cost-effectiveness of auto collection and relay of hydrologic and env mental data. The U.S. Geological Survey's Na wide Computer System, tied into the Data C tion System of Landsat, gives 150 remote minals almost real-time access to processed from 75 DCPs. Additional capacity for DCP is afforded by the NOAA series of Geostati Operational Environmental Satellites. (Woo USGS)
W76-05431

7C. Evaluation, Processing and Publication

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, USER'S GUIDE.
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W76-05001

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, (CARD DECK).
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W76-05002

NUMERICAL SIMULATION OF SALT-WATER NTRUSION IN COASTAL AQUIFERS, PART 1,
rinceton Univ., N. J. Dept. of Geological and Geophysical Sciences.
or primary bibliographic entry see Field 5B.
V76-05010

IUMERICAL SIMULATION OF SALT-WATER NTRUSION IN COASTAL AQUIFERS, PART 2,
rinceton Univ., N. J. Dept of Geophysical ciences.
or primary bibliographic entry see Field 5B.
/76-05011

TOCHASTIC PROJECTIONS FOR WATER ESOURCES PLANNING,
exas Univ. at Austin. Center for Research in /ater Resources.
or primary bibliographic entry see Field 6A.
'76-05012

HE DETECTION AND MAPPING OF SUBTERANEAN WATER BEARING CHANNELS--HASE II,
issouri Univ., Rolla. Dept. of Geophysics.
or primary bibliographic entry see Field 4B.
76-05129

UBLIC GROUNDWATER SUPPLIES IN HAMPAIGN COUNTY,
inois State Water Survey, Urbana.
r primary bibliographic entry see Field 4B.
76-05130

'BLIC GROUNDWATER SUPPLIES IN CALOUN COUNTY,
nois State Water Survey, Urbana.
r primary bibliographic entry see Field 4B.
'6-05131

BLIC GROUNDWATER SUPPLIES IN MASC COUNTY,
nois State Water Survey, Urbana.
primary bibliographic entry see Field 4B.
6-05132

PROPOSED INDEX FOR COMPARING DROGRAPHS,
ryland Univ., College Park. Dept. of Civil Engering.
primary bibliographic entry see Field 2A.
6-05157

PABILITY OF INTEGER PROGRAMMING GORITHMS IN SOLVING WATER SOURCE PLANNING PROBLEMS,
h Center for Water Resources Research, an.
primary bibliographic entry see Field 6A.
-05183

FLOOD PLAIN INFORMATION: FARMINGTON AND CONNECTICUT RIVERS, WINDSOR, CONNECTICUT.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-05256

FLOOD PLAIN INFORMATION: WEST BRANCH DUPAGE RIVER, KRESS CREEK, AND KLEIN CREEK, DUPAGE COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-05257

SPECIAL FLOOD HAZARD INFORMATION: DUNN BRANCH, WOODBINE, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-05258

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND WILD HORSE CREEK, HOLLY, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-05262

1973 WESTERN STATE CONFERENCE ON WATER INFORMATION DISSEMINATION.
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 10D.
W76-05270

SALINE WATER CONVERSION ENGINEERING DATA BOOK - 1975.
Kellogg (M. W.) Co., Piscataway, N. J.
For primary bibliographic entry see Field 3A.
W76-05347

SYMPOSIUM ON REMOTE SENSING IN GLACIOLOGY.
International Glaciological Society, Cambridge (England).
For primary bibliographic entry see Field 2C.
W76-05372

VELOCITY OF RADIO WAVES IN ICE BY MEANS OF A BORE-HOLE INTERFEROMETRIC TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05383

SEA-ICE RECONNAISSANCE BY RADAR,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 7B.
W76-05387

CHARACTERIZATION OF COLD-REGIONS TERRAIN USING AIRBORNE LASER PROFILOMETRY,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 7B.
W76-05393

A SUBMARINE SONAR STUDY OF ARCTIC PACK ICE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05394

ERTS DATA IN GLACIOLOGY--AN EFFORT TO MONITOR GLACIER MASS BALANCE FROM SATELLITE IMAGERY,
Norges Vassdrags- og Elektrisitetsvesen, Oslo.
For primary bibliographic entry see Field 7B.
W76-05397

GENERAL DISCUSSION, THE STATE OF THE ART--AND WHERE DO WE GO FROM HERE.
For primary bibliographic entry see Field 2C.
W76-05400

FLOOD PROFILES AND INUNDATED AREAS ALONG THE DESCHUTES RIVER, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W76-05415

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
T. J. Major, and K. D. Vaught.
Open-file report, February 1976. 29 p, 2 fig, 1 tab.

Descriptors: *Hydrologic data, *Groundwater resources, *Well data, *Water levels, *Colorado, Aquifers, Water utilization, Irrigation, Basic data collections, Great Plains.
Identifiers: *Northern high plains(Colo).

Water-level measurements were made in more than 600 northern Colorado wells in January 1976. Changes in water levels from January 1975 to January 1976 ranged from a rise of about 5 feet (1.5 metres) in Washington County to a decline of about 20 feet (6.1 metres) near the Kiowa-Prowers County line. Measurements for the four preceding winters are also included to serve as references illustrating declining or rising water levels. These data can be used by well owners for planning their schedules for the next irrigation season and can be used by water managers for developing plans to manage the groundwater resources. (Woodard-USGS)
W76-05420

ANNUAL MAXIMUM STAGES AND DISCHARGES OF NORTH CAROLINA STREAMS,
Geological Survey, Raleigh, N. C.
N. O. Thomas, and W. G. Bonham.
North Carolina Department of Natural and Economic Resources, Raleigh, Report, 1975. 223 p 4 fig, 1 tab, 22 ref.

Descriptors: *Annual peak discharge, *North Carolina, *Streams, *Stream gages, Hydrologic data, Floods, Streamflow, Flood control, Basic data collections.
Identifiers: *Annual maximum stage, Flooding potential.

Annual maximum stages and discharges are presented for continuous-record and crest-stage gaging stations in North Carolina. Data are included for 391 active and discontinued stations operated by the U. S. Geological Survey and other Federal agencies, primarily the National Weather Service, for which there were five or more years of record as of September 30, 1973. The location and pertinent information on the operation of each gaging station are also given. Basic data on flood stages and discharges are needed for zoning flood plains, for flood-proofing of structures, and for assessing flood damages and the value of channel improvements. (Woodard-USGS)
W76-05423

GROUND-WATER DATA NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.

J. R. Harrill, and J. O. Nowlin.
Open-file report 76-90, 1976. 12 p 2 fig, 2 tab, 4 ref.

Descriptors: *Basic data collections, *Groundwater, *Well data, *Aquifer characteristics, *Water levels, *Nevada, Land development, Septic tanks, Environmental effects, Hydrologic systems, Recreation facilities.
Identifiers: *Topaz Lake area(Nev).

This report contains a tatulation of data for 34 wells and 2 springs, photo-base maps showing contours of the altitude of and depth to water in wells, and a tabulation of 17 drillers'logs in an area adjacent to the northwest shore of Topaz Lake, a small reservoir about 20 miles south of Gardnerville in Douglas County, Nev. The study area encompasses approximately 1 square mile extending about 1.5 miles north along U. S. Highway 395 from the Nevada-California State line. The area is on a moderately to steeply sloping surface composed primarily of alluvial fan deposits. Boulder and clay deposits typical of those formed by mudflows predominate in the south half of the area. Some sand and gravel deposits also underlie the margins of the lake and the east-central partof the area. There are about 60 residences, 3 restaurant-lodge facilities, and a campground-marina in the area. All are served by septic-tank systems. If fully developed according to current plans, the area would contain slightly more than 200 residences. The purpose of this study is to provide data on groundwater conditions that are prerequisite to any analysis of effects of septic-tank effluent on the hydrologic system. (Woodard-USGS)
W76-05424

GEOHYDROLOGIC RECONNAISSANCE AND MEASUREMENT OF PERENNIAL STREAMS CROSSING OUTCROPS OF THE MADISON LIMESTONE, NORTHEASTERN WYOMING, 1974,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2E.
W76-05425

TIME-OF-TRAVEL OF SOLUTES IN THE TRINITY RIVER BASIN, TEXAS, SEPTEMBER 1973 AND JULY-AUGUST 1974,
Geological Survey, Fort Worth, Tex.
R. H. Ollman.
Open-file report 75-558, November 1975. 3 sheets, 2 fig, 2 tab.

Descriptors: *Travel time, *Rhodamine, *Dyes, Streamflow, *Path of pollutants, *Texas, Low flow, Average flow, Data collections, Gaging stations, Sampling, Analytical techniques, Fluorometry, Hydrographs, *Maps, Forecasting, Water quality, Mathematical models.
Identifiers: *Trinity River basin(Tex).

The U. S. Geological Survey, in cooperation with the U. S. Army Corps of Engineers and the Trinity River Authority of Texas, conducted time-of-travel studies in the Trinity River basin during a period of low flow September 19-23, 1973, and during a period of moderate flow July 23-August 1, 1974. The purpose of these studies was to provide data that could be used by the Trinity River Authority as part of the basic input to a mathematical water-quality model of the river. The model is being developed as part of a comprehensive water-quality management plan for the basin. The time-of-travel of solutes in the Trinity River and West Fork Trinity River was determined by injecting a fluorescent dye (Rhodamine WT, 20-percent solution) that could be detected by fluorometric analysis of water samples collected at selected downstream sites. Plots of observed dye concentration versus time were made for each injection and sampling site, and a smooth curve was drawn. The resulting curves were then used to determine arrival times of the leading edge, the peak, and the trailing edge of the dye cloud. The trailing edge was defined as the concentration value equal to 10 percent of the peak concentration. Measurements of the concentration and dispersion of the dye provide information on the probable behavior of soluble contaminants that might be introduced in the reaches studied. (Woodard-USGS)
W76-05426

WATER RESOURCES OF BASINS FOR MINOR STREAMS DRAINING INTO ST. CLAIR RIVER, LAKE ST. CLAIR, DETROIT RIVER, AND LAKE ERIE, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
F. R. Twenter, R. L. Knutilla, and T. R. Cummings.
For sale by USGS Reston, Va 22092, for $2.50 per set. Hydrologic Investigations Atlas HA-546, 1975. 3 sheets.

Descriptors: Water resources, *Surface waters, *Groundwater, *Water quality, *Michigan, Hydrologic data, *Maps, Hydrology, Precipitation(Atmospheric), Streamflow, Runoff, Aquifers, Water quality, Water utilization, Water supply, Hydrogeology, Topography, Lakes, Lake Erie.
Identifiers: *St. Clair River basin(Mich), *Detroit River basin(Mich), Minor streams(Southeastern Mich).

This hydrologic atlas represents a part of a comprehensive study of the water resources of southeastern Michigan. Its purpose is to provide information on (1) the physical features of basins for minor streams draining into St. Clair River, Lake St. Clair, Detroit River, and Lake Erie, (2) the characteristics of streamflow, (3) the quality of surface water and groundwater, and (4) the availability of groundwater. The atlas is one in a series on the river basins in southeastern Michigan. The minor streams in southeastern Michigan drain an area of 985 sq mi, which includes parts of St. Clair, Macomb, Wayne, Washtenaw, Lenawee, and Monroe Counties. Almost all the land surface drained by the streams was formerly covered by glacial lakes. The minor streams have natural drainage networks that are not well developed. Most streams have eroded less than 10 ft below the adjacent land surface. In short reaches, generally near their mouths, the streams are incised more than 10 ft. In all areas drained by the minor streams, natural drainage has been augmented by ditches and drains. There are about 450 lakes and ponds within the study area. Most lakes and ponds are relatively small; 52 percent are less than 1 acre; only 11 percent exceed 10 acres. (Woodard-USGS)
W76-05427

WATER RESOURCES OF THE MISSISSIPPI AND SAUK RIVERS WATERSHED, CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
J. O. Helgesen, D. W. Ericson, and G. F. Lindholm.
For sale by USGS Reston, Va 22092, for $2.25 per set. Hydrologic Investigations Atlas HA-534, 1975. 3 sheets, 19 ref.

Descriptors: *Water resources, *Watersheds(Basins), *Mississippi River, *Minnesota, Hydrology, Precipitation(Atmospheric), *Maps, Surface waters, Streamflow, Runoff, Groundwater resources, Aquifers, Water quality, Water utilization, Water supply, Hydrogeology.
Identifiers: *Sauk River basin(Minn).

A variety of glacial landforms (moraines, till plains, drumlim fields and outwash plains) characterize the 3,890-square mile Mississippi and Sauk Rivers watershed in central Minnesota. Maps and illustrations show, in addition to other data, that: (1) Average annual inflow to the watershed, as precipitation, was 26.6 in. during 1939-68. Average annual outflow during the same period was 4.4 in. as runoff and 22.2 in. as evapotranspiration. (2) All municipalities except St. Cloud use groundwater as a source of supply. St. Cloud, the largest city, obtains its water from the Mississippi River. Nearly all the 1,890 million gallons of groundwater withdrawn by municipalities in 1968 was from glacial-drift aquifers. (3) Water usage for irrigation, primarily on sandy soils derived from surficial outwash, totaled 1,090 million gallons in 1968. (4) Flow characteristics of the Mississippi River are affected by regulation of six reservoirs upstream from the watershed. (5) The quality of Mississippi River water does not change significantly as it moves through the watershed. Dissolved-solids content, iron content, and color vary significantly with discharge. (6) Groundwater and surface water are of the calcium magnesium bicarbonate type and chemically suitable for most purposes. Iron and manganese concentrations and hardness in groundwater are troublesome in some areas. (Woodard-USGS)
W76-05428

WATER RESOURCES OF THE HURON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Grayling, Mich.
R. W. Larson, W. B. Allen, and S. D. Hanson.
For sale by USGS Reston, Va 22092, for $1.75 per set. Hydrologic Investigations Atlas HA-514, 1975. 2 sheets.

Descriptors: Water resources, *Surface waters, *Groundwater, *Water quality, *Michigan, Hydrologic data, *Maps, Hydrology, Watersheds(Basins), Streamflow, Runoff, Lakes, Aquifers, Water yield, Water utilization, Water demand, Water supply, Urbanization.
Identifiers: *Huron River basin(Mich).

This hydrologic atlas represents a part of a comprehensive study of the water resources of southeastern Michigan. Its purpose is to provide information on (1) physical features of the Huron River and its tributaries, (2) characteristics of streamflow, (3) quality of ground and surface water, and (4) availability of groundwater. The atlas is one in a series on river basins in southeastern Michigan. The Huron River basin, in the zone of influence of the Detroit metropolitan area, has been subjected to urbanization. Population between 1960 and 1970 in Washtenaw County increased by 35.8 percent. The city of Ann Arbor grew in population by 48.2 percent, Ypsilanti by 40.9 percent, and Livingston County by 54.2 percent. The basin drains a hatchetshaped area of 90 sq mi. Continental glaciers covered the entire basin and left deposits of sand, sandy till, and gravelly loam. About 80 percent of the basin is underlain by these deposits. The basin has more than 300 named natural and artificial lakes ranging in size from less than an acre to the 1,270 acre Base leville Lake. In addition, there are more than 7 unnamed lakes and ponds. Most lakes are depressions left by glaciers in the morainal area north and west of Ann Arbor. (Woodard-USGS)
W76-05429

HYDROLOGIC UNIT MAP--1974, CARIBBEAN REGION.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va. 22092, for $1.0
Hydrologic Unit Map, 1975. 1 sheet.

Descriptors: *Maps, *Hydrology, *Puerto Rico, Water resources, Islands, Data collection, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Caribbean Region(PR), Isla Vieques(PR), Isla De Culebra(PR), Isla Mona(PR), *Hydrologic unit maps, Hydrologic boundaries, Subregions, Accounting units, Catologing units.

This map and accompanying table show Hydrologic Units in the Caribbean Region that are basically hydrographic in nature. The islands included are Puerto Rico, Isla De Vieques, Isla De Culebra, and Isla Mona. The Cataloging Units shown will s

lant the Cataloging Units previously used by the
. S. Geological Survey in its Catalog of Informa-
on on Water Data (1966-72). The Regions, Subre-
ions and Accounting Units are aggregates of the
ataloging Units. The Regions and Subregions are
rrently (1974) used by the U. S. Water
esources Council for comprehensive planning,
cluding the National Assessment, and as a stan-
rd geographical framework for more detailed
ater and related land-resources planning. The
ccounting Units are those currently (1974) in use
the U. S. Geological Survey for managing the
ational Water Data Network. (Woodard-USGS)
76-05430

EMOTE SENSING,
eological Survey, Reston, Va.
r primary bibliographic entry see Field 7B.
76-05431

ESIGN OF GROUND WATER LEVEL OBSER-
ATION-WELL PROGRAMS,
eological Survey, Raleigh, N. C. Water
sources Div.
r primary bibliographic entry see Field 4B.
76-05451

ENGINEERING WORKS

A. Structures

ONOMIC IMPACT OF FISCAL CON-
RAINTS ON WATER PROJECT CONSTRUC-
ON, USER'S GUIDE.
rza Engineering Co., Chicago, Ill.
primary bibliographic entry see Field 6B.
6-05001

ONOMIC IMPACT OF FISCAL CON-
RAINTS ON WATER PROJECT CONSTRUC-
ON, (CARD DECK).
rza Engineering Co., Chicago, Ill.
primary bibliographic entry see Field 6B.
6-05002

RSPECTIVES ON THE ARMY ENGINEERS
TER MANAGEMENT MISSION,
ps of Engineers, Washington, D.C.
primary bibliographic entry see Field 6E.
5-05211

Hydraulics

SIBILITY OF HYDRAULIC TRANSPORT
GROUND HOUSEHOLD REFUSE
OUGH SEWER APPURTENANCES,
er-Miller Associates, Inc., Waltham, Mass.
primary bibliographic entry see Field 5D.
-05070

APPLICATION OF A SPILLWAY FOR
ER FLOOD CONTROL,
nes Water Authority. London (England).
primary bibliographic entry see Field 4A.
-05098

GITUDINAL DISPERSION IN NATURAL
NNELS,
ogical Survey of Canada, Ottawa (Ontario).
rimary bibliographic entry see Field 5B.
05160

ME STUDY OF KNICKPOINT DEVELOP-
T IN STRATIFIED SEDIMENT,
ey Univ. (Australia). Dept. of Geography.
rimary bibliographic entry see Field 2J.
05162

HEAT DISSIPATION FROM TURBULENT OPEN CHANNEL FLOW,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05248

HYDRAULIC DESIGN CRITERIA FOR INLAND WATERWAYS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
J. S. McNown.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 771, $4.00 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Institute, Manhattan, KWRRI Contribution No. 168, October 1975. 23 p, 7 fig, 1 tab, 10 ref. OWRT A-071-KAN(1), 14-31-0001-5016.

Descriptors: *Channel flow, *Design criteria, *Inland waterways, *Hydraulic design, *Canals, Channels, Navigation.
Identifiers: *Sinkage, Squat, Inland navigation, Power requirement, Ship drag.

The sinkage of a ship in a canal, which is due to the lowering of the water surface around it during the motion, can be readily calculated for canals of various cross sections. It is a function of the canal cross-section, the depth of water in the canal, the submerged cross-section of the ship or barge tow and the speed of the ship. The relationship can be expressed in both algebraic and graphical forms. The maximum sinkage is about one-fifth of the depth and occurs for a retangular channel with a barge that fills about one-fifth of the channel cross-section. More power is required to move a ship through a canal than in open water. The main reason is the constriction of the return flow in which the ship moves a large quantity of water from foreward of the ship, through the depressed area around it and astern where it returns to the normal level. Thus it raises a sizable amount of water a small vertical distance which is equal to the sinkage. Comparisons of calculations of the increase in power required based on this concept of the motion agree remarkably well with observed values obtained in a series of model studies at the University of Michigan.
W76-05254

RESISTANCE TO FLOW IN A COMBINED CHANNEL,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
C. E. Rice, and R. Araveeporn.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 5, p 869-872, September-October, 1975. 6 fig, 3 ref. OWRT A-030-OKLA(3)

Descriptors: *Open channel flow, *Flood plains, *Roughness(Hydraulic), Hydraulics, Streams, Roughness coefficient, Channel flow, Hydraulic radius, Mannings equation, Flow, Laboratory tests, Flow resistance.
Identifiers: *Combined channel, *Hydraulic depth.

These experiments studied the flow characteristics in a combined channel with different hydraulic properties, main channel to floodplain widths and areas, slopes, and roughness. The results showed: (1) the hydraulic radius as ordinarily computed in a regular channel results in erroneous discharge values for a combined channel in the depth range immediately above bankfull stage of the main channel; (2) the floodplain flow appeared to have some retarding effect on the flow in a main channel; (3) the combined channel Manning coefficient increased as the floodplain width increased; (4) as the flood plain width decreased, the Manning coefficients for the floodplain and main channel approached the same value at floodplain to main channel depth ratios less than about 0.4; (5) the Manning coefficient for the combined channel reflects the effect of channel geometry as well as the effects of boundary roughness and slope; (6) the hydraulic radius of the floodplain was greater with a divider separating the two sections than without a divider for the same depth of flow in the main channel; (7) none of the methods commonly used to compute uniform flow discharge in a combined channel gave good results over the complete range of flow depths; and (8) except at very shallow floodplain depths, there was no difference in water surface elevation between the main channel and floodplain sections. (Lee-ISWS)
W76-05273

8C. Hydraulic Machinery

READILY ATTACHABLE WATER FILTER WITH CUTOFF VALVE,
Aqua-Chem, Inc., Milwaukee, Wis. (assignee)
R. M. McClory.
U.S. Patent No. 3,926,815, 4 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1337, December 16, 1975.

Descriptors: *Patents, *Filters, *Water purification, *Water quality, *Water quality control, *Filtration, Domestic water, Water pollution control, *Valves, Equipment.
Identifiers: Filter cartridges, Replaceable equipment.

A water filter assembly permits filter cartridge removal and replacement in fast and simple manner without shutting off the main water supply and without cutting pipe. The filter unit includes a filter mounting block having internal conduit for directing water from a manifold on one face of the block through a filter housing containing a filter cartridge mounted on the opposite face of the block. Severed ends of the existing water pipe are brought into abutting relationship with the manifold and sealed to it by a suitable cover. The filter mounting block includes a valve for shutting off the internal conduits so that the filter housing may be removed to enable filter cartridge replacement. Sealing means are provided for adapting the unit to different pipe sizes. (Sinha - OEIS)
W76-05038

WATER POWER MACHINE AND UNDERSEA, UNDER WATER GENERATOR STATION,
R. E. Skorupinski.
U.S. Patent No, 3,927,330, 7 p, 5 fig, 8 ref Official Gazette of the United States Patent Office, Vol 941, No 3, p 1471, December 16, 1975.

Descriptors: *Patents, *Tidal streams, *Currents(Water), *Flow control, *Tidal energy, Todal effect, Tidal power plants, Underwater, Energy transfer, Energy conversion, Electric power.

An apparatus which intercepts a tidal flow or established stream in a larger body of water includes a framework supported on a foundation which is sunk on the bottom of a body of water. The framework includes a number of upright members which support a conveyor belt. The conveyor belt travels between two rollers and has a main or straight run along the length of the apparatus and a return run. The first run carries a number of buckets which are deployed to intercept the current flow. The buckets are constructed out of a number of pivotally mounted plates which have rollers on the end which engage guide rails which cause the plates to deploy at an extended position, thereby opening a chamber which is adapted to be filled with water. The chambers in the buckets dump water at the end of the first run and are pivotally constructed and arranged to collapse. The current flow is directed into the buckets by a set of louvers which are pivotally mounted to direct water flow toward the chambers in the bucket. The louvers pivotally rotate as a unit to

vary the angle of attack. The conveyor is connected to a link chain which is engaged with end rollers. The end rollers provide a power source which is taken off by a drive shaft connected to an electromechanical converter such as an alternator. The alternator provides electrical power. The control apparatus includes a mechanism for adjusting the louvers and a angle of the transverse plate. (Sinha - OEIS)
W76-05039

CROSS-CONNECTION CONTROL MANUAL.
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-05092

GUIDELINES FOR THE SELECTION OF TURBINE PUMP MATERIALS FOR USE IN GROUNDWATERS,
Queensland Univ., Brisbane (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8G.
W76-05406

SUPPRESSION OF DOMESTIC WATER HAMMER NOISE BY A SIMPLE WAVE DISPERSION TECHNIQUE,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 8G.
W76-05408

8E. Rock Mechanics and Geology

FLUME STUDY OF KNICKPOINT DEVELOPMENT IN STRATIFIED SEDIMENT,
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W76-05162

8F. Concrete

PROTECTING REINFORCED CONCRETE PIPE SANITARY SEWERS,
K. Kienow.
Water and Sewage Works, Vol. 122, No. 10, p 94-97, October, 1975. 1 fig, 1 tab, 1 ref.

Descriptors: *Concrete pipes, *Sewers, *Alkalinity, *Pipes, Penetration, Rates, Design criteria, Engineering, Performance, Corrosion control.
Identifiers: *Sanitary sewers, Centrifugally spun concrete pipes.

A test program resulted in an equation from which the alkalinity of the inside of a concrete pipe could be determined. Design parameters on the life expectancy of centrifugally spun concrete pipe could be determined. Methods of increasing life expectancy have included adding extra concrete over reinforcing steel, using high alkaline aggregates, and using inert liners. An equation was published by the Environmental Protection Agency that relates the rate of penetration, or life expectancy, of a concrete pipe to the alkalinity of the inner wall. When concrete pipe is centrifugally spun high alkalinity results in the center. Tests have shown that such pipe has twice the corrosion resistance than conventionally made pipe. The alkalinity of the inside of the pipes was determined so that the designer could use the EPA information with regard to rate of penetration. Two methods are outlined. In one method, the time to penetrate the pipe wall is related to the alkalinity and the wall thickness. This product is known as the 'At' factor. In the most applied method, the time to expose the steel is related to the product of alkalinity and cover thickness over the reinforcing steel, 'Az'. This can be specified by the design engineer. The 'Az' number usually ranges from 0.20 to 2.25. The upper boundary corresponds to maximum sulfide values that usually occur in waste water. Various design examples are presented. (Pinto-FIRL)
W76-05099

8G. Materials

METHYLENE PHOSPHONATES OF GLYCIDYL REACTED POLYALKYLENE POLYAMINES AND USE IN SCALE AND CHELATION,
Petrolite Corp., St. Louis, Mo. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05030

PROTECTING REINFORCED CONCRETE PIPE SANITARY SEWERS,
For primary bibliographic entry see Field 8F.
W76-05099

CORROSION IN DISPOSAL WELLS,
Subsurface Disposal Corp., Houston, Tex.
For primary bibliographic entry see Field 5E.
W76-05125

THE DETECTION AND MAPPING OF SUBTERRANEAN WATER BEARING CHANNELS--PHASE II,
Missouri Univ., Rolla. Dept. of Geophysics.
For primary bibliographic entry see Field 4B.
W76-05129

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER - PHASE II,
Illinois State Water Survey, Urbana.
T. E. Larson, F. W. Sollo, Jr., and F. F. McGurk.
Available from the National Technical Information Service, Springfield, Va, 22161, as PB-250 458, $4.50 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 108, February 1976. 57 p, 17 tab, 39 ref. OWRT B-082-ILL(1). 14-31-0001-4078.

Descriptors: *Hardness(Water), *Scaling, *Corrosion, *Calcium carbonate, Magnesium, Sodium, Potable water, Water quality, *Solubility, *Hydrogen ion concentration, Volumetric analysis, Water supply.
Identifiers: Complexes, Dissociation constants, pHs.

Water utilities have a tremendous investment in the miles of pipe, valves, and other appurtenances in water distribution systems. Failure to protect these systems against corrosion and excessive scale formation could necessitate replacement of the distribution systems at an estimated cost of $25 billion. Calculation of the true equilibrium or saturation pH, pHs, for calcium carbonate and adjustment of the water to that pH is essential to supply water of high quality and to avoid corrosion and scale formation in these water distribution systems. In some cases the actual pH must be from 0.6 to 1.0 unit above pHs, as determined from the calcium and alkalinity analyses. Certain complexes may be responsible in part for this fact. The objective of this study was to evaluate the dissociation constants of the complexes so that the optimum pH can be more accurately calculated. A titration method was used to measure the effects of complex formation on the pH of reaction mixtures and appropriate computer programs were developed to calculate the dissociation constants. Experimental procedures and results from the determination of dissociation constants for complexes of magnesium, calcium and sodium with carbonate, bicarbonate, hydroxide, and sulfate and a method to utilize these constants in calculating pHs in public water supplies are discussed. (See also W73-13004)
W76-05180

SALINE WATER CONVERSION ENGINEERING DATA BOOK - 1975.
Kellogg (M. W.) Co., Piscataway, N. J.
For primary bibliographic entry see Field 3A.
W76-05347

GUIDELINES FOR THE SELECTION OF TUBINE PUMP MATERIALS FOR USE I GROUNDWATERS,
Queensland Univ., Brisbane (Australia). Dept. Chemical Engineering.
G. J. Kelly, and R. G. Kemp.
Australian Water Resources Council Technic Paper No. 14, 1975. 33 p, 4 fig, 6 tab, 3 append.

Descriptors: *Pumps, *Corrosion, *Groundwate Materials, *Australia, Chemical properties, Wat wells, Hydrogen ion concentration, Salinit Hardness(Water), Materials testing, Alloys, Sta less steel.

The vertical turbine pump is frequently used Australia to supply water for irrigation, urban a industrial requirements. The results of a survey areas in which corrosion problems of varying tensity have occurred are used to identify the fa tors determining corrosivity of groundwater; an series of tests also compared the resistance several alternative materials for pump constr tion. The factors identified as indicators of c rosivity are pH, Langelier Saturation index, a the ratio of chlorides to carbonates. A table gi values of these indices for groundwater at a ra of Australian locations. Methods of field de mination of the factors are given in the app dices. Wrought martenisitic and cast austen stainless steels are shown to be suitable for pu construction in a wide range of bore wat (CSIRO)
W76-05406

SUPPRESSION OF DOMESTIC WAT HAMMER NOISE BY A SIMPLE WA DISPERSION TECHNIQUE,
New South Wales Univ., Kensington (Austra Faculty of Military Studies.
T. B. Guy.
Water (Journal of the Australian Water and Wa water Association) Vol. 2, No. 4, p 12 December, 1975. 5 fig, 1 ref.

Descriptors: *Water hammer, *Attenuat *Domestic water, Pipelines, Waves(Wa Surges, Water pressure, Hydraulic equipment. Identifiers: *Wave dispersion, *Noise supp sion(Water).

Shock wave and sound wave attenuation by wave dispersion technique is already establis for the case of waves in air, but has never bee plied previously to the case of hydraulic wave liquids. An example of the efficiency of a w dispersion type attenuator in reducing impul hydraulic noise is described by its application domestic water supply system. The attenua technique is shown to substantially reduce the pulsive noise from a domestic water meter rapid turnoff of a tap, using a relatively small simply constructed attenuator. (CSIRO)
W76-05408

WATER TREATMENT--TECHNIQUE ENERGY CONSERVATION,
Betz Entec, Inc., Trevose, Pa.
For primary bibliographic entry see Field 5F.
W76-05438

8I. Fisheries Engineering

DIELDRIN CONTAMINATION OF CHANNEL CATFISH, INVERTEBRATES AND MINNOWS FROM THE DES MOINES RIVER,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 5C.
W76-05457

A PRELIMINARY REPORT ON THE CONEWAGO CREEK FAUNAL SURVEY, LANCASTER COUNTY, PENNSYLVANIA,
York Coll., Pa.
For primary bibliographic entry see Field 5C.
W76-05470

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1974-JUNE 30, 1975.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 9D.
W76-05247

1974-1975 ANNUAL REPORT, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9D.
W76-05255

9B. Education (In-House)

MANUAL FOR TRAINING IN THE APPLICATION OF THE PRINCIPLES AND STANDARDS OF THE WATER RESOURCES COUNCIL.
Colorado State Univ., Fort Collins. Environmental Resources Center.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 959 $3.00 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, December 1974. 515 p, 138 fig, 21 tab, 18 ref, 2 append. Edited by H. P. Caulfield, H. A. Steele, and S. H. Johnson, Jr. OWRT C-5345(No. 42).

Descriptors: Water resources, *Cost-benefit analysis, *Planning, *Regional analysis, *River basin development, *Training, Costs, Benefits, Decision making, Projections, Measurement, Economic impact, Environmental effects, Systems analysis, Publications, *U S Water Resources Council, Regional Development.
Identifiers: Public participation, Social well-being, Regional economic development, Environmental quality.

Materials for the conduct of training courses are set forth. Principles and Standards relate directly to Federal water resources planning but state and local agencies and private firms need to understand their application to Federal and Federally assisted projects. Levels of planning are identified: framework studies and assessment which deal with major policy decisions; regional or river basin plans; and implementation studies. The principles apply at all levels but the components of objectives will be specified differently though in a manner providing insights about tradeoffs among alternatives. The planning process is visualized in steps: identification of components of objectives; evaluation of resource capabilities; development of alternative plans; examination of beneficial and adverse effects on the accounts of national economic development (NED), environmental quality (EQ), regional development (RD), and social well-being (SWB); and selection of a plan. Discussed in detail are: the planning process which is viewed as an open process responsive at all levels to preferences of the affected public; projections which require comparing beneficial and adverse conditions with and without the plan under consideration, and sensitivity analysis to deal with uncertainty; environmental projections and carrying capacity models; measurement of NED, EQ, RD, and SWB effects; the application of systems analysis to planning problems including cost accounting, cost allocations and river basin simulation; and the role of public participation in the decision-making process. (Smith - North Carolina).
W76-05348

EVALUATION REPORT OF THE TRAINING PROGRAM ON TRANSFER OF TECHNOLOGY..TRAINING OF GOVERNMENT PERSONNEL IN THE APPLICATION OF THE PRINCIPLES, STANDARDS AND PROCEDURES FOR PLANNING OF THE WATER RESOURCES COUNCIL,
Colorado State Univ., Fort Collins. Human Factors Research Lab.
D. D. Sjogren, and R. D. Wittman.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 965 $5.00 in paper copy, $2.25 in microfiche. Colorado Environmental Research Center, Fort Collins, December 1974. for planning of the Water Resources Center. 90 p 4 append. OWRT-X-143(No.4260).

Descriptors: Water Resources, *Planning, *Training, *Evaluation, Technology, Personnel, *U S Water Resource Council, Standards, Information exchange.
Identifiers: *Government personnel, Bear River Basin, *Technology transfer.

The 47 trainees and 33 observers at this training session August 11-27, 1974, had diverse backgrounds and had been involved to varying degrees with the Principles and Standards (P and S) for planning of the Water REsources Council. Training was held because of changes in P and S and an awareness of disparity between planning expectations and final planning product. Before training, expert advice was solicited and many suggestions were incorporated into training. Program consisted of 5 days dealing with conceptual issues and 5 days of practical simulation. It was considered successful, well coordinated and held in excellent facilities. Negative comments concerned the planning exercise: too contrived, too complex for the time allowed, and not coordinated with the rest of the program, though well worth doing. Some felt the formal lectures were too long and also too familiar for those who were more experienced, indicating that those with unusual backgrounds were not as well served. A majority said they would recommend the course to others. Sessions at noon were used for feedback and questionnaires were given to 6 trainees questioning the quality of the day's sessions. Comments at end of program were diverse: expected more controversy; highlighted problems; because of diverse levels of understanding, presentations had to be basic and general; program well organized; expected gap between concept and application was confirmed. Most positive aspect was the opportunity to interact with a spectrum of other professionals. On the average trainees felt that the content level of the sessions was about right, as was the quantity of material. (Smith -North Carolina)
W76-05349

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1974-JUNE 30, 1975.
California Univ., Davis. Water Resources Center.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 780, $5.50 in paper copy, $2.25 in microfiche. University of California Water Resources Center Report No. 34, December 1975. 104 p. OWRT A-999-CAL(11).

Descriptors: *Research and development, *Water resources institute, *California, *Projects, Grants, Contracts, Universities training, Education, Project life.
Identifiers: Freshwater projects, Research results.

The principal investigators of fresh water projects sponsored by the Water Resources Center have submitted their annual reports, from which the most essential information has been abstracted to form this narrative section. The individual narratives have been purposely kept brief. Each emphasized, wherever possible, the 'hard' results and the actual or potential applications of those results to benefit affected interests. Shown also are starting and scheduled ending dates for each research project. The reader may infer from these the relative degree of progress achieved to date, together with an indication of when further information might become available--usually at least six months after completion of the project for any detailed account. The Report covers both State of California and Federally funded research activities. (Snyder-California, Davis)
W76-05247

1974-1975 ANNUAL REPORT, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 720, $4.50 in paper copy, $2.25 in microfiche. 1975 Annual Report, Report UNC-WRRI-75-00, (1976), 58 p. OWRT A-999-NC(47), 14-31-0001-5033.

Descriptors: *Water Resources Institute, Education, *Research and development, *North Carolina, *Projects, Grants, Contracts, Universities, Training.

The Water Resources Research Institute is The University of North Carolina's water research center. Located at N. C. State University at Raleigh, the Institute serves all sixteen campuses of The University of North Carolina System. It works closely with the Department of Natural and Economic Resources and other agencies in the formulation of a research program responsive to State water resource problems. A 26-man Advisory Committee representative of State and Federal water agencies, industry, conservation, agriculture, local government, and the general public provides program guidance and review. The Institute's research program for FY 1974-75 was supported by an annual allotment and 13 matching grants from OWRT, USDI; a grant from EPA; matching State appropriations; matching funds from Pickle Packers International, Inc. (made direct to the principal investigator); and grants from the Division of Environmental Management, N. C. Department of Natural and Economic Resources. One research project was jointly supported by the Institute and the University of North Carolina Sea Grant Program. All senior colleges and universities in North Carolina are eligible to participate in the Institute's program. During FY 1974-75, projects were conducted at N. C. State University, University of North Carolina at Chapel Hill, Duke University, East Carolina University, and University of North Carolina at Charlotte.
W76-05255

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY OF WATER RESOURCES OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
R. T. Pfund, and J. W. Wickes.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 115, $5.50 in paper copy, $2.25 in microfiche copy. Technical Report No. 88, May 1975, 111 p. OWRT A-042-HI(1), 14-01-0001-4011.

Descriptors: *Bibliographies, *Hawaii, *Publications, Aquifers, Floods, Islands, Groundwater, Geology, Hydrology, *Irrigation, Climatology, Meteorology, Pesticides, Rainfall, Sewage, Sewage treatment, Water resources, Water pollution, Soils, Legislation, Water management(Applied), Computer programs.

This bibliography is a compilation of approximately 1,000 references on studies of water resources of the Hawaiian Islands; it complements and supplements an earlier compilation with the same title (see W72-00805). An IBM KWIC (Key Word in Context) program, written in FORTRAN, was modified to collate the information and provide author and subject indexes.
W76-05013

MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS, REFERENCES, REGULATIONS, GUIDANCE, PROCEDURES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W76-05075

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W76-05093

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05D.
W76-05094

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) Associates, Media, Pa.
For primary bibliographic entry see Field 05D.
W76-05095

POLLUTION EFFECTS ON SURFACE AND GROUND WATERS, (LITERATURE REVIEW),
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W76-05176

1973 WESTERN STATE CONFERENCE ON WATER INFORMATION DISSEMINATION.
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 10D.
W76-05270

10D. Specialized Information Center Services

1973 WESTERN STATE CONFERENCE ON WATER INFORMATION DISSEMINATION.
Arizona Water Resources Research Center, Tucson.
Proceedings of a Conference held June 8, 1973, Phoenix, Arizona. 98 p. OWRT A-999-ARIZ(4).

Descriptors: *Water resources, *Information exchange, *Conferences, *Information retrieval, Publications, Computers, Communication, Water quality, Water supply, Southwest U.S.
Identifiers: *Western U.S., *Water information systems.

The purpose of this conference was to bring together the researcher and user on a regional basis in an attempt to produce new ideas and directions that can lead to the coordinated action needed to improve the dissemination of water information. Reports were presented on the water resources information dissemination activities of the various states. Two panel discussions were also held. These concerned ways that information systems can better respond to state needs, and the needs and opportunities for coordinated regional or interstate action. (Sims - ISWS)
W76-05270

10F. Preparation Of Reviews

PRETREATMENT AND ULTIMATE DISPOSAL OF WASTEWATER SOLIDS,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 05D.
W76-05079

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05D.
W76-05093

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05D.
W76-05094

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) Associates, Media, Pa.
For primary bibliographic entry see Field 05D.
W76-05095

POLLUTION EFFECTS ON SURFACE AND GROUND WATERS, (LITERATURE REVIEW),
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W76-05176

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
For primary bibliographic entry see Field 05C.
W76-05405

e 48

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 12
JUNE 15, 1976

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 12
JUNE 15, 1976

W76-05501 -- W76-06150

etary of the U.S. Department of the Interior has de-
that the publication of this periodical is necessary in the
on of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ted aspects of the life, physical, and social sciences as l as related engineering and legal aspects of the charac-stics, conservation, control, use, or management of water. h abstract includes a full bibliographical citation and a set lescriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-rch categories established by the Committee on Water sources Research of the Federal Council for Science and hnology.

SIC IS NOT PRESENTLY IN A POSITION TO PROVIDE PIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-. Sufficient bibliographic information is given to enable ders to order the desired documents from local libraries ther sources.

ected Water Resources Abstracts is designed to serve scientific and technical information needs of scientists, ineers, and managers as one of several planned services he Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the rior and has been designated by the Federal Council for ence and Technology to serve the water resources com-nity by improving the communication of water-related earch results. The Center is pursuing this objective by co-nating and supplementing the existing scientific and tech-l information activities associated with active research investigation program in water resources.

provide WRSIC with input, selected organizations with ve water resources research programs are supported as nters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection

05 WATER QUALITY MANAGEMENT AND PROTECTION
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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

NATURE AND STABILITY OF COMPLEX MERCURY COMPOUNDS IN SURFACE AND GROUND WATERS, PHASE II,
Auburn Univ., Ala. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-05838

2. WATER CYCLE

2A. General

QUURM - A REALISTIC URBAN RUNOFF MODEL,
Queen's Univ., Kingston (Ontario).
W. E. Watt, and C. H. R. Kidd.
Journal of Hydrology, Vol. 27, No. 3/4, p 225-235, December, 1975. 3 fig, 2 tab, 10 ref.

Descriptors: *Hydrographs, *Storm runoff, *Model studies, Urban runoff, Sewers, Rainfall-runoff relationships, Computers, Simulation analysis, *Computer models, Computer programs.

In order to develop better techniques for the prediction of urban storm runoff, the Queen's University urban runoff model (QUURM) was developed and tested for application at the existing or planning level. The principal criterion in the selection of the model was its ability to simulate observed flows with a minimum number of flow parameters and reasonable costs for computer and data collecting time. The model consists of two parts. The first part is the total catchment made up of hydrographs taken from four subcatchments. The subcatchments were an impervious front such as a paved street, a pervious front such as a front lawn, a pervious and impervious back such as a back roof and back lawn, and a non-contributing area such as an area lower than the adjacent inlet to the storm-sewer system. The second part of the model combined the hydrographs and routed them through the sewer pipe network to the outlet. The infiltration rate was determined by employing Horton's equation for infiltration capacity. QUURM's simulation results, taken from 10 rainfalls during two summers, were then compared with three other models' results taken from the same rainfalls. QUURM's results compared favorably, and a detailed comparison of QUURM and the EPA model is presented in tables and graphs. The advantages of QUURM are that it is a relatively simple model with a limited number of parameters. (Loustau-FIRL)
W76-05577

DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Texas Univ. at Austin. Dept. of Petroleum Engineering.
J. M. Knapp, D. W. Green, E. C. Pogge, and C. Sanford.
Water Resources Research, Vol. 11, No. 6, p 879-888, December 1975. 11 fig, 1 tab, 17 ref. OWRT A-055-KAN(1).

Descriptors: *Hydrologic systems, Hydrology, Simulation analysis, *Mathematical models, Surface-groundwater relationships, Groundwater movement, Streamflow, Soil types, Hydrologic cycle, Soil moisture, Soil water movement, Groundwater recharge, *Computer models, Hydrologic units, Watersheds(Basins), Hydrographs, *Kansas.
Identifiers: *Groundwater levels, Hydrologic simulation, *Little Arkansas River(Kan), Upper soil zone, Lower soil zone.

A computer model consisting of both surface water and groundwater phases and their interaction has been developed to simulate the hydrology of a stream basin. Input to the model includes precipitation, climatic conditions, boundary and initial conditions, and basin constants. Provision has been made for modeling withdrawals from both groundwater and surface water for consumptive use. The computer output includes streamflow hydrographs at selected points, groundwater levels, and groundwater recharge and discharge from the basin. The model was designed to be general in nature so that it will be applicable to different basins with similar geographic and geological conditions. Its structure is such that the basin is divided vertically into four layers and a stream network. The four vertical layers are, in order from top to bottom, a surface layer, an upper soil zone, a lower soil zone, and a groundwater layer (aquifer). Provision was also made to subdivide each layer horizontally into blocks, or sub-basins, which are determined by considering topography, soil types, and climatic data. The model was described in detail, and its application to the Little Arkansas River basin of south central Kansas was made. A 25-year period of history in this basin was simulated, and comparisons were made between calculated behavior and measured hydrologic behavior in the basin. (Terstriep-ISWS)
W76-05745

EVALUATION OF DATA AVAILABILITY AND EXAMPLES OF MODELING FOR GROUNDWATER MANAGEMENT ON CAPE COD, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 4B.
W76-05856

DEPENDABLE YIELD OF RESERVOIRS WITH INTERMITTENT INFLOWS,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
For primary bibliographic entry see Field 4A.
W76-05908

COMMENT UPON MULTIVARIATE SYNTHETIC HYDROLOGY,
Centro di Ricerca IBM di Pisa (Italy).
G. Finzi, E. Todini, and J. R. Wallis.
Water Resources Research, Vol. 11, No. 6, p 844-850, December 1975. 4 fig, 9 tab, 10 ref.

Descriptors: *Synthetic hydrology, *Streamflow, *Markov processes, *Stochastic processes, Storm runoff, Water resources development, Optimum development plans, Persistence, Computer programs, *Algorithms.
Identifiers: Multisite, Multiseason, *Reservoir optimization, *Matalas algorithm, Numerical multisite package, Generated sequences, Lag-one Markovian model.

A correction to Young and Pisano's numerical multisite package was proposed. It was believed necessary but insufficient to make the computer coding reproduce the desired Matalas algorithm for Markovian synthetic flows. In addition, it was believed that the sequences generated by even a corrected computer program may not always be adequate for reservoir optimization studies. Multisite multiseason synthetic hydrology can be a useful tool in the evaluation of proposed water reservoir systems. However, the simple lag one monthly Markovian model produces population statistics for which many of the observed statistics would have to be considered as rare events. In particular, if persistence (runs of high or low values), or the magnitude and probability of extreme events are important, then there are grounds to question the validity of using such a simple algorithm for the generation of synthetic sequences. (Morris - ISWS)
W76-05909

USING PARAMETRIC MODELS OF RUNOFF TO IMPROVE PARAMETER ESTIMATES FOR STOCHASTIC MODELS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W76-05911

WIND EFFECTS ON STREAM FLOWS,
Delaware Univ., Newark. Coll. of Marine Studies; and Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-05921

GEOLOGY AND WATER RESOURCES OF CHARLES MIX AND DOUGLAS COUNTIES, SOUTH DAKOTA, PART I: GEOLOGY,
Geological Survey, Vermillion, S. D.
For primary bibliographic entry see Field 4A.
W76-05923

HYDROLOGIC ASPECTS OF URBANIZATION,
For primary bibliographic entry see Field 4C.
W76-05925

MAPS OF THE ELEMENTS OF THE HYDROLOGIC BUDGET OF ASIA,
Akademiya Nauk SSSR, Moscow. Institut Gregrafii.
G. M. Nikolayeva, and G. M. Chernogayeva.
Soviet Hydrology, Selected Papers, No. 2, p 126-132, 1974. 5 fig, 11 ref. Translated from News of the USSR Academy of Sciences, Geographic Series (Isvestiya Akad. nauk SSSR, Ser. geograf.), No. 2, p 89-97, 1974.

Descriptors: *Asia, *Hydrologic budget, *Maps, Precipitation(Atmospheric), Evaporation, Groundwater, Streamflow, Runoff, Monsoons, Rainfall, Climatology, Mapping.

Maps were constructed on the basis of computations by a method based on a system of water-balance equations where total river runoff is separated into its surface and underground components, and the total wetness of the area is defined as the difference between evaporation and surface runoff. To determine the input of the hydrologic budget, i.e., precipitation, a map of annual precipitation totals was used. Daily information on discharges published in hydrologic yearbooks, national runoff maps, and fragmentary published information were used to study total river runoff. These materials served as a basis in the construction of generalized maps of the elements of the hydrologic budget (total river runoff, its surface and underground components, evaporation, and total wetness), which can be used to analyze the distribution of these elements in Asia. (Sims - ISWS)
W76-05934

2B. Precipitation

PRECIPITATION MANAGEMENT FOR RECLAMATION OF OVERGRAZED AREAS IN ARID AND SEMI-ARID REGIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 166, $3.50 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report, January 1976, 10 p. OWRT A-026-COLO(1). 31-1372-1603.

Descriptors: *Precipitation(Atmospheric), *Arid lands, *Revegetation, Mine wastes, Economics, *Environmental effects, *Strip mine wastes,

Feasibility studies, *Land reclamation, Management.

An investigation was made of the feasibility of utilizing precipitation management as a method for the vegetative restoration of strip mine spoils in arid and semi-arid areas, and for the economic and environmental improvement of reclaimed mine spoils. The procedure is believed to be capable of producing vegetative systems of higher economic and wildlife habitat value than exists naturally on these same lands or might be produced by other non-irrigated methods. It would appear that the cost of the necessary R&D program would be minimal, particularly when compared with the potential economic, environmental and social benefits which would accrue.
W76-05603

ISOTOPIC STUDY OF HAIL,
Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires; and Commissariat a l'Energie Atomique, Saclay (France). Departement de Recherche et Analyse.
J. Jouzel, L. Merlivat, and E. Roth.
Journal of Geophysical Research, Vol. 80, No. 36, p 5015-5030, December 20, 1975. 17 fig, 4 tab, 32 ref, 2 append.

Descriptors: *Hail, *Isotope studies, *Tritium, *Deuterium, Radioisotopes, Stable isotopes, Tracers, Thunderstorms, Precipitation(Atmospheric), Cloud physics, Ice, Water, Freezing, Meteorology.
Identifiers: Hailstones.

A detailed interpretation and discussion was presented of deuterium and tritium measurements carried out on six hailstones. The isotopic variations of condensed water in a hail cloud were studied on the basis of a cloud model proposed by A. J. Chisholm. The influence of the existence of a liquid water accumulation zone and of the presence of hailstones on isotopic profiles was also analyzed. The importance of tritium analysis was demo deuterium were defined. The interpretation and discussion of the experimental results were based mainly on the measurements made on three hailstones produced during a storm on August 7, 1971, in the province of Albnstrated, and conditions of validity of the isotopic model proposed by L. Merlivat, G. Nief, and in the case oferta in Canada. It was demonstrated that the hailstones were formed during a succession of upward and downward movements, at least two of the latter occurring in the updraft core, and that the distribution of the updraft velocity with altitude was not stable during the storm, a finding which is in agreement with its multicellular nature. (Sims - ISWS)
W76-05665

DESIGN AND RESULTS OF COMPARATIVE TESTS OF A RAINFALL RECORDER OPERATING FOR A WEEK (WRR),
For primary bibliographic entry see Field 7B.
W76-05674

FIELD OBSERVATIONS OF THE PERSISTENCE OF AGI-NH4I-ACETONE ICE NUCLEI IN DAYLIGHT,
Bureau of Reclamation, Miles City, Mont. Div. of Atmospheric Water Resources Management.
For primary bibliographic entry see Field 3B.
W76-05677

TREND ANALYSIS OF ANNUAL INDIAN RAINFALL,
Institute of Tropical Meteorology, Poona (India).
B. Parthasarathy, and O. N. Dhar.
Hydrological Sciences Bulletin, Vol. 20, No. 2, p 257-260, June 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Rainfall, Rain gages, *Time series analysis, Statistics, Monsoons, Wet seasons, Dry seasons.
Identifiers: *India, *Trend analysis, *Annual Indian rainfall, Mean annual rainfall, Standard deviation.

The average annual rainfall of the Indian area (excluding the island territories in the Arabian Sea and the Bay of Bengal) was calculated for each year from 1901 to 1960 by using data from 3,000 raingages distributed uniformly throughout the country. This time series of rainfall has been subjected to statistical analysis. It was found that the mean annual rainfall was of the order of 1190 mm with a standard deviation of 95 mm. The southwest monsoon season (June-September) rainfall contributed about 75% of the mean annual rainfall. The wettest year (1917) had a rainfall 22% in excess of the mean annual rainfall, and this was immediately followed by the driest year (1918) which was lower than the mean annual rainfall by about 19%. The mean values of the annual rainfalls for the 30-year period from 1931 to 1960 showed a significant increase of about 5%. (Roberts-ISWS)
W76-05691

CONTINUOUS SEASONAL PROBABILITY OF EXTREME RAINFALL EVENTS,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
W. M. Snyder.
Hydrological Sciences Bulletin, Vol 20, No 2, p 275-283, June 1975. 6 fig, 2 tab, 7 ref.

Descriptors: *Probability, *Rainfall, *Seasonal, Distribution, Probable maximum precipitation, Least squares method, Stochastic processes.
Identifiers: *Lognormal distribution, *Extreme rainfall events, Seasonal probability, Cyclic functions, Extreme daily rains.

The lognormal distribution was adapted to seasonally continuous distribution by making two of its three parameters cyclic functions of annual time. Distribution parameters were evaluated by treating 12 monthly distributions as a continuum of data. Simultaneous evaluation of all parameters was accomplished by nonlinear least squares. The extreme daily rainfall from each month of record was used. The method thus provided for 12-fold increase in utilization of recorded data over the conventional annual series. The derived distributions were used to generate stochastic future monthly sequences of extreme daily rains. (Roberts - ISWS)
W76-05692

STATISTICS OF RAINGAGE DATA,
McGill Univ., Montreal (Quebec). Dept. of Physics.
G. Drufuca, and I. I. Zawadzki.
Journal of Applied Meteorology, Vol. 14, No. 8, p 1419-1429, December 1975. 15 fig, 6 tab, 5 ref.

Descriptors: *Rainfall, *Rainfall disposition, *Rainfall intensity, Rates, Precipitation(Atmospheric), Rain, *Statistics, Probability, Data processing, Correlation analysis, Rain gages, Storms, Meteorology.

Ten years of raingage data were processed to obtain a statistical description of the precipitation process at the ground as function of time at a point and as function of space using the concept of 'synthetic storm'. Probability distributions of various parameters were given: mean rainfall rate, total amount, maximum rate, mean square rate, duration length, decorrelation time and distance. The joint distributions of mean rate, maximum rate and total amount were also determined. The probability distribution of rainfall rate was calculated and the effect of time smoothing of the data was studied. Some information about the spatial structure of the precipitation process was given as joint probability of rainfall rate at two points for various separation distances and by the space au tocorrelation function. (Sims - ISWS)
W76-05693

ON RADAR-RAINGAGE COMPARISON,
Quebec Univ., Montreal. Dept. of Physics.
I. I. Zawadzki.
Journal of Applied Meteorology, Vol. 14, No. 8, 1430-1436, December 1975. 6 fig, 2 tab, 8 ref.

Descriptors: *Rainfall, *Radar, *Rain gages, Mea surement, Analytical techniques, Data processin Correlation analysis, Precipitation(Atmospheric Meteorology.
Identifiers: *Radar-rainfall relationships, *Rada rainfall measurements, Integration times.

Spacial smoothing by the radar beam as well a post-detection integration reduce the variability the distribution of rainfall rate in space. It wa shown that when radar data are compared with i stantaneous point rainfall rate a random error an a bias are introduced by the smoothing. This cou account for some of the difficulties in th hydrological use of radars. It was shown that whe raingage data are smoothed in time there is an op timum smoothing time interval such that the ra dom error and the bias are reduced to a negligib level. A method was suggested for the optimu comparison of radar and raingage data, and th possibility of a determination of Z-R relationshi from such comparisons was discussed. (Sims ISWS)
W76-05694

DETACHMENT OF PENDANT WATER DRO BY HIGH VOLTAGE PULSES,
State Univ. of New York, Albany. Dept. of A mospheric Sciences.
M. Nifuku, and B. Vonnegut.
Journal of Applied Meteorology, Vol. 14, No. 8, 1617-1619, December 1975. 1 fig, 4 ref. ON N00014-71-C-0156.

Descriptors: *Drops(Fluids), *Cloud physic *Laboratory equipment, Electrical equipmen Laboratories, Equipment, Electricity, Researc facilities, Research equipment, Meteorology.
Identifiers: *High voltage pulses, Drop formatio

In the conduct of various laboratory experimen in cloud physics it is sometimes necessary produce liquid droplets having a known size of t order of millimeters in diameter. An experiment arrangement was described in which dr detachment is produced electrostatically by t application of a high voltage pulse. It was sho that an isolated water drop of any desired size the range 0.2 to 5.1 mm diameter can readily formed on demand by using the method to deta a drop hanging from the end of a small tube. Wh all of the experiments were made with water, t same apparatus can also be used with other liqui if their electrical relaxation time is small compar to the pulse duration and if their viscosity is n too large. (Sims-ISWS)
W76-05917

POSSIBILITY OF DETERMINING THE ARE OF HEAVY PRECIPITATION BY DISCRET REPRESENTATION OF RADAR DATA,
B. Sh. Divinskaya.
Soviet Hydrology, Selected Papers, No. 2, p 10 109, 1974. 3 tab, 5 ref. Translated from Transa tions of the Main Geophysical Observatory (Tru GGO), No. 309, p 15-22, 1974.

Descriptors: *Precipitation(Atmospheri *Radar, *Rainfall, Data processing, Analytic techniques, Rainfall intensity, Storms, Thu derstorms, Meteorology, Estimating, Forecastin
Identifiers: *Shower areas, Rainfall patterns.

A method was proposed for estimating the to shower area from the number of echo cells w

howers, determined by the observation method
f the Main Geophysical Observatory. The
roposed method was based on the conversion of
ie number of discrete shower echo cells to the
umber of showers and subsequently to the total
hower area. This method made it possible to
etermine the echo area with a probable error of
bout 30%. The relation between the measurement
rors and the number of cells with showers was
etermined, making it possible to estimate not
nly the area of the precipitation echo, but also the
ossible errors in per cent for each specific obser-
ation series. It was found that the shower echo
eas vary within a relatively broad range, so that
onsiderable errors appear in the determination of
eir total area. Therefore, the proposed method
ust be considered as a first approximation in the
oblem being solved. To reduce the errors, it was
oposed to investigate in the future the possibility
introducing corrections by taking into account
e intensity of shower echoes, which correlates
th the shower areas. (Sims - ISWS)
76-05933

RFACE ENERGY BUDGET OF SOME CLI-
ATIC REGIMES IN WEST AFRICA,
pe Coast Univ. (Ghana). Dept. of Physics.
N. De-Heer-Amissah.
ana J Sci. 13(2): 109-123. 1973.

scriptors: *Africa, Rain forests, *Tropical re-
ns, Wet climates, *Wet seasons, Forests, Soil
isture, Soil water, *Heat budget, Evapotrans-
ation.
ntifiers: *Savanna, West Africa.

e heat budget of the savanna and equatorial rain
est was studied. The energy balance terms are
culated from synoptic observations. Energy
n-over shows striking differences from station
station and from season to season. The seasonal
iation is largest in the thick forest belt where
maximum occurs during the dry season. As a
sequence, forest areas should exhibit more
nounced annual weather changes. This conclu-
n does seem to be a variance with what is ob-
ved in nature since atmospheric activity is more
nounced during the transition between wet and
periods. Perhaps a truer picture would emerge
nonthly turnovers over a period of years are
pared. Radiation balance in both regions are
itive throughout the year. In general soils with
water holding capacity have higher rates of
potranspiration. Evapotranspiration is con-
led not so much by soil water content by itself,
by soil water tension. Soil moisture as a limit-
factor on evapotranspiration is very
nounced in the savanna belt.--Copyright 1975,
logical Abstracts, Inc.
5-06006

MATIC WATER BALANCE AT HISSAR,
yana Agricultural Univ., Hissar (India).
. Bishnoi, and S. M. Virmani.
yana Agric Univ J Res. 3(3): 131-134. 1973.

criptors: *Water balance, Asia, Evapotrans-
ion, *Climates, Water supply.
tifiers: *Hissar(India), Water deficit, Water
lus.

udy was undertaken to determine the principal
ents of climatic water balance at Hissar
a). Potential evapotranspiration, water
it and water surplus was determined on a
ly basis. The water deficiency was about 91
hile the water surplus was 7.9 cm.--Copyright
, Biological Abstracts, Inc.
-06041

CTS OF A TROPICAL CYCLONE ON LIT-
AL AND SUB-LITTORAL BIOTIC COM-
ITIES AND ON A POPULATION OF DU-
GS (DUGONG DUGON (MULLER)),
s Cook Univ., of North Queensland,
sville (Australia).

For primary bibliographic entry see Field 2L.
W76-06131

2C. Snow, Ice, and Frost

EVALUATION OF THE TROPHIC TYPES OF SEVERAL ALASKAN LAKES BY ASSESSMENT OF THE BENTHIC FAUNA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W76-05604

LAKE AND SHORE ICE CONDITIONS ON SOUTHEASTERN LAKE MICHIGAN IN THE VICINITY OF THE DONALD C. COOK NUCLEAR PLANT: WINTER 1973-74,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
E. Seibel, C. T. Carlson, and J. W Maresca, Jr.
Special Report No 55, 1975. 61 p, 13 fig, 2 tab, 15 ref, 6 append.

Descriptors: *Lake Michigan, *Ice, Ice cover, Lake ice, Lake shores, Lakes, Shores, Nuclear powerplants, Winter, Photography, Winds, Deterioration, Wind velocity, Sediment load.
Identifiers: *Shore ice, Donald C. Cook Nuclear Plant(Mich), Time lapse photography, Nearshore zone, Ice accretion, Wind direction, Ice ridges, Oblique photographs.

A time lapse photographic system designed to take oblique photographs of the nearshore zone at the Donald C. Cook Nuclear Plant in southeastern Lake Michigan was used to provide a nearly continuous record of ice conditions during the 1973-74 winter season. The ice conditions have been categorized into five distinct stages: no ice, static, accretion, deterioration, and breakup. These five stages of ice development were related to wind direction, wind speed, air temperature, and water temperature. A typical sequence of shore ice formation through breakup was established through qualitative analysis of the photographs. The typical sequence was influenced by the complex interrelationship between the climatic variables and ice stage development. Quantitative analysis of the photographs was used to test and subsequently verify the hypothesis that the nearshore ice ridges, offshore bars, and breaker zones are coincident in location at approximately 40 and 100 meters from the water's edge. The observations revealed that large quantities of sediment are incorporated into the nearshore ice and that the nearshore ice ridges ground themselves on the nearshore bottom to protect the shoreline from erosion from winter storms. (Roberts - ISWS)
W76-05664

COLLAPSE OF THE HUDSON BAY ICE CENTER AND GLACIO-ISOSTATIC REBOUND,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geological Sciences.
J. T. Andrews, and W. R. Peltier.
Geology, Vol.4 No.2,p73-75 NSF GA-43191. 2 fig. 18 ref. Feb 1976.

Descriptors: *Ice, *Ice cover, Geology, *Geologic history, Model studies, Mathematical models, Geologic time, Quaternary period, History, Geophysics, Geomorphology, Glaciers, Glaciology, *Canada.
Identifiers: *Hudson Bay(Canada), Paleogeology, *Laurentide Ice Sheet, Ice shelves, Deglaciation, Geophysics models, Mantle.

An ice-unloading model for Hudson Bay consistent with the rebound history of the Ottawa Islands requires collapse of the central dome of the Laurentide Ice Sheet between 12,000 and 10,000 years ago. Hudson Bay was then filled by a shallow ice shelf with ice streaming into the bay from ice centers located over Keewatin and Labrador. The observed rebound is fully consistent with a uniform mantle viscosity of 10 to the 22nd power poises. (Sims-ISWS)
W76-05669

THE MOVEMENT OF MELTING ICE OVER ROUGH SURFACES,
Bristol Univ. (England). H. H. Wills Physics Lab.
B. D. Chadbourne, R. M. Cole, S. Tootill, and M. E. R. Walford.
Journal of Glaciology, Vol. 14, No. 71, p 287-292, 1975. 2 fig, 1 tab, 16 ref.

Descriptors: *Ice, *Melting, *Movement, Laboratory tests, Surfaces, Physical properties, Glaciers, Glaciology.
Identifiers: *Regelation, Bed-slip processes.

Laboratory experiments showed that pieces of melting ice about one centimeter across, moving under normal loads across roughened glass surfaces, travel much faster than regelation theory predicts. The discrepancy is as much as 40 times for the finest scale surfaces (prepared by grinding with carborundum particles of 60 micrometers mean diameter), and increases further if the load is reduced below three bars. On the other hand melting ice moves, under similar conditions, across rough porous glass surfaces at approximately the speed predicted by regelation theory. It was suggested that the reason is that melt water, produced by the dissipation of frictional energy, accumulates at the interface between ice and ground glass where it promotes sliding, but can easily drain away from a porous surface. Similar effects at the bed of a temperate glacier may cause the contribution of regelation to the bed-slip process to depend sensitively upon the melt-water regime. (Sims-ISWS)
W76-05671

THE PERMITTIVITY AND ATTENUATION IN POLYCRYSTALLINE AND SINGLE-CRYSTAL ICE IH AT 30 AND 60 MHZ,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Glaciology Div.
G. P. Johari, and P. A. Charette.
Journal of Glaciology, Vol. 14, No. 71, p 293-303, 1975. 3 fig, 1 tab, 23 ref.

Descriptors: *Ice, *Electrical properties, *Laboratory tests, Attenuation, Anisotropy, Crystals, Physical properties, Electrical studies, Electromagnetic waves, Remote sensing, Glaciers, Ice cover, Glaciology.
Identifiers: Permittivity, Polarization, Radio-echo sounding.

The relative permittivity, epsilon prime, and attenuation, alpha, in laboratory-grown, polycrystalline and single-crystal ice Ih are reported at 35 and 60 MHz in the temperature range -25 C to -0.2 C. The epsilon prime and alpha at 35 MHz and -1 C are 3.208 plus or minus 0.010 and 6.2 plus or minus 0.1 dB/100 m, respectively. From a comparison between the respective epsilon prime and alpha of the polycrystalline and a single-crystal ice measured perpendicular to the c-axis, it was concluded that any anisotropy of polarization at these frequencies is so small as to be undetectable. Amongst several factors that may contribute to anisotropy in ice, electronic polarization contributes 0.0037 to the difference between the relative permittivity measured parallel and perpendicular to the c-axis at -1 C and at frequencies less than 500 THz. Experiments have shown that the plastic deformation resulting from a uniaxial compressive stress of up to 100 bar does not influence the relative permittivity and attenuation of ice at 35 and 60 MHz. (Sims-ISWS)
W76-05672

BRITTLE FRACTURE OF ICE AT 77 K,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate; and Department of the Environment, Ottawa (Ontario). Glaciology Div.
V. R. Parameswaran, and S. J. Jones.
Journal of Glaciology, Vol. 14, No. 71, p 305-315, 1975. 9 fig, 3 tab, 23 ref.

Descriptors: *Ice, *Physical properties, *Strength, Stress, Strain, Crystals, Temperature, Yield strength, Mechanical properties.
Identifiers: Low temperatures, Fractures.

Laboratory-grown single crystals, both pure and HF-doped, and pure polycrystals of ice, as well as natural, columnar-grained ice from the River St. Lawrence, have been deformed in uniaxial compression at 77 K at strain-rates between 0.00001 and 0.001/s. Brittle fracture was observed, with stress-strain curves similar to those found for rocks at room temperature. The first cracks appeared at low stresses, about 0.3 MN/sq m, in agreement with theory, but the failure or fracture stress was high about 50 MN/sq m. The ratio of experimental to theoretical strength was 0.28. HF doping of the single crystals had no effect at this temperature. (Sims-ISWS)
W76-05673

INTERNAL REFLECTIONS IN POLAR ICE SHEETS,
Birmingham Univ. (England). Dept. of Physics.
J. G. Paren, and G.de Q. Robin.
Journal of Glaciology, Vol 14, No 71, p 251-259, 1975. 1 fig, 3 tab, 18 ref.

Descriptors: *Ice, *Radio waves, *Reflectance, Glaciers, *Polar regions, Ice cover, Radar, Electromagnetic waves, Electrical properties, Electrical studies, Anisotropy, Physical properties, Glaiology.
Identifiers: *Internal reflections, *Polar ice sheets, Loss tangents.

Internal reflections are due to changes in electrical admittance betwen adjacent depositional layers. Reflection coefficients are given for discontinuous changes in either the permittivity or loss tangent. The observed strengths of internal echoes rule out the possibility that they are caused by isolated layers containing 'foreign' material, but suggest instead that they are due to systematic fluctuations of density, anisotropy, or loss tangent. The electrical behavior of ice from polar ice sheets was reviewed and compared with that of ice grown in controlled laboratory conditions. It was suggested that the impurity distribution in polycrystalline ice is dependent on the impurity content and the temperature of freezing, and the conductivity is essentially determined by the intrinsic and impurity defects within the crystal lattice. In apolar ice sheet, density fluctuations decrease with depth, whereas loss tagents (and hence their fluctuations) increase since the ice becomes warmer towards bedrock. Echo strengths in central Antarctica were compared with those calculated for a boundary where either all bubbles disappear or the loss tagent changes by 50%. Assuming a constant layering geometry to 2,700 m depth, density fluctuations account for echoes above 1,500 m, but deeper echoes are best explained by variations in the ice conductivity. (Sims -ISWS)
W76-05681

EQUILIBRIUM-LINE ALTITUDES, MASS BALANCE, AND JULY FREEZING-LEVEL HEIGHTS IN THE CANADIAN HIGH ARCTIC,
Massachusetts Univ., Amherst. Dept. of Geology and Geography.
R. S. Bradley.
Journal of Glaciology, Vol. 14, No 71, p 267-274, 1975. 4 fig, 1 tab,15 ref.

Descriptors: *Glaciers, *Arctic, *Canada, Freezing, Ablation, Temperature, Snow, Ice, Glaciology.
Identifiers: *Equilibrium-line altitudes, Freezing-level heights, Mass balance, Glacier growth.

Equilibrium-line altitudes on the White Glacier, Axel Heiberg Island, and the north-west sector of the Devon Ice Cap were shown to be closely related to mean July freezing-level heights at nearby upper-air weather stations. An inverse relationship between July freezing-level heights and mass balance on the Devon Ice Cap was also shown. Reasons for such correlations were suggested and some limitations of the relationship were outlined. Recent lowering of the freezing level in July was discussed in relation to the theoretical 'steady-state' equilibrium-line altitudes in the Canadian high Arctic. It was suggested that positive mass-balance years have predominated over a large part of northern Ellesmere Island and north-central Axel Heiberg Island since 1963, and some glaciological evidence supporting this hypothesis was given. (Sims - ISWS)
W76-05682

SUBLIMATION OR MELTING: OBSERVATIONS FROM THE WHITE MOUNTAINS, CALIFORNIA AND NEVADA, U.S.A.,
Lethbridge Univ. (Alberta). Dept. of Geography.
C. B. Beaty.
Journal of Glaciology, Vol 14, No 71, p 275-286, 1975. 6 fig, 2 tab, 29 ref.

Descriptors: *Snow, *Mountains, *Sublimation, *Evaporation, Ablation, Snowpacks, Snow cover, Melting, Runoff, Snowmelt, Melt water, Water yield, Radiation, Solar radiation, Temperature, California, Nevada.
Identifiers: *White Mountains(Nev and Calif).

Study of the waning snow-pack along the crest of the White Mountains of California and Nevada in 1970 and 1974 indicated that a significant proportion of the high-altitude snow in the range sublimates and/or evaporates shortly after melting. Qualitative and limited quantitative evidence suggested that the amount of snow thus disposed of may be as much as 50-80% of the total springtime pack. Meteorological observations in the White Mountains demonstrated that atmosphere conditions particularly favorable effective sublimation/evaporation is common in May and June, the main ablation period in the mountains. The geneneral lack of evidence of surficial erosion on slopes above 3,500 m, often supposed to be widespread and caused by so-called 'snow-melt' runoff, was therefore readily explained--there is little 'snow-melt' erosion simply because there is only limited snow-melt. (Sims - ISWS)
W76-05683

NUCLEATION CHARACTERISTICS OF STREAM WATER AND FRAZIL ICE NUCLEATION,
Alaska Univ., College. Geophysical Inst.
T. E. Osterkamp, and R. E. Gilfilian.
Water Resources Research, Vol. 11, No. 6, p 926-928, December 1975. 3 fig, 11 ref. NSF GA-30748

Descriptors: *Frazil ice, *Streams, *Nucleation, *Alaska, Freezing, Drops(Fluids), Cold regions, Water, Ice, Temperature, Water temperature, Open channels, Crystallization.

A drop-freezing experiment was used to study the nucleation characteristics of some natural water samples taken from a supercooled stream in interior Alaska. A histogram of drop-freezing events, the differential nucleus spectrum and the cumulative nucleus spectrum described the experimental results. The drops froze over a temperature range from -4.3 C to -13.9 C with an average nucleation temperature of -8.2 C + or -1.5 C. The results of these experiments were compared to observations made during periods of frazil ice production in the stream. It was concluded that the supercooling necessary for spontaneous heterogeneous nucleation of ice in a thin surface layer of stream water would be about -4 C. Since the surface tempe ture of the supercooled stream was found to be + or - 0.5 C, frazil ice crystals cannot be nuclea spontaneously in the surface layer of water. (Si - ISWS)
W76-05695

SOME OBSERVATIONS ON THE BEHAVI OF THE LIQUID AND GAS PHASES IN TE PERATE GLACIER ICE,
Washington Univ., Seattle. Geophysics Progra
C. F. Raymond, and W. D. Harrison.
Journal of Glaciology, Vol. 14, No. 71, p 213-2 1975. 9 fig, 3 tab, 23 ref, 4 append. NSF GA-285

Descriptors: *Glaciers, *Ice, *Bubbles, M water, Air, Cores, Core drilling, Sampling, On- investigations, Flow rates, Glaciolo *Washington.
Identifiers: *Blue Glacier(Wash).

Microscopic and textural observations were m on ice samples cored from Blue Glacier slig below the equilibrium line to depths of 60 m. servations were started within a few minutes a collection. Water was found in veins along th grain intersections, in lenses on grain boundar and in irregular shapes. Gas was found in bub in the interior of crystals, in bubbles touc veins, and locally in veins. Vein sizes sho some spread; average cross-sectional area about 0.0007 sq mm with no discernible trend texture or depth except within 7 m of the surf Before the samples were examined, they c have experienced a complex relaxation w could have changed them significantly. As res was not possible to determine the in situ siz veins, but an upper limit could be determi Also it was not possible to predict intergran water flux per unit area, but 0.1 m per an represents an upper limit. In coarse-grained ic water flux density is likely to be even sma because of a low density of veins and blockin bubbles. This indicates that only a very small tion of the melt-water production on a ty summer day can penetrate into the glacier on a tergranular scale except possibly near the surf The existence of conduit-like features in se cores suggested that much melt water nevertheless penetrate the ice locally wit large-scale lateral movements along the gl surface. The observed profile of ice tempera indicated that the intergranular water flux ma much smaller than the upper limit determined the core samples. (Sims-ISWS)
W76-05915

THE THERMAL REGIME OF TRAPRI GLACIER AND ITS RELEVANCE TO GLAC SURGING,
British Columbia Univ., Vancouver. Dept Geophysics.
G. T. Jarvis, and G. K. C. Clarke.
Journal of Glaciology, Vol. 14, No. 71, p 235 1975. 7 fig, 3 tab, 39 ref.

Descriptors: *Glaciers, *Temperature, *Su *Canada, On-site investigations, Measuren Boreholes, Movement, Mountains, Glaciology Identifiers: *Trapridge Glacier(Yukon T *Surging glaciers, Glacier surging, Gl behavior, Ice temperatures.

A deep-ice temperature measurement progran been conducted on Trapridge Glacier, Yukon ritory. Large regions of temperate ice were dicted at the base of the otherwise cold gla The glacier snout, frozen to bedrock, appear act as an ice dam allowing the build up of a reservoir in the upper regions. Thermal regul of the surges of Trapridge Glacier was sugg and the relevance of basal temperatures in surging glaciers was discussed. (Sims-ISWS)
W76-05916

SNOW ACCUMULATION AND MELTING IN THE FOREST AND IN CLEAR-CUT AREAS IN THE CENTRAL URAL,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Lesovodstva i Mekhanizatsii Lesnogo Khozyaistva, Pushkino (USSR).
V. A. Mel'chanov.
Soviet Hydrology, Selected Papers, No. 5, p 466-472, 1973. 1 fig, 5 tab, 19 ref. Translated from Forestry (Lesovedeniye), No. 5, p 15-21, 1973.

Descriptors: *Snow, *Snowpacks, *Melting, Melt water, Snow surveys, Forests, Coniferous forests, Snowmelt, Snowfall, Water equivalent, Runoff, Runoff forecasting, Vegetation effects, Forest management, Clear-cutting.
Identifiers: *USSR.

nvestigations showed that snow accumulation in he forest depends on the composition, density nd age of plantations, the density of the forest anopy, and climatic characteristics of a given re-ion. Coniferous plantations intercepted 9.7% of he amount of snow falling in the open. The water quivalents of snow were lower in very dense lantations than in thin plantations of the same omposition. They were 6-19% higher in birch than n spruce plantations. At the mountain station inter precipitation amounted to 89% in young tands and 86% in a mature coniferous forest, ompared to the water equivalent of snow in a nar-ow felling. At the foothill station, the water quivalents of snow were the same in the forest nd fellings, according to 3 years of observation. y snow-melting time, the greatest snow depth as recorded in young stands, then in fellings, and he lowest in the forest. The felling of coniferous orests promotes rapid snow disappearance and a wofold increase in snow melting rate. The dura-on of snow melting is the same in fellings and oung stands and amounts to 10-26 days in the oothills of the Ural and 23-30 days in the moun-ins. In coniferous forests the snow melts within 5-37 days in the foothills and 38-47 days in the ountains. The snow melting rate is 2-4 times ower in fellings on southern than northern slopes. Sims-ISWS)
76-05929

XPLOITATION OF THE WATERS OF SUB-ERMAFROST ARTESIAN BASINS,
or primary bibliographic entry see Field 3B.
76-05930

ANT DEVELOPMENT UNDER SNOW,
isconsin Univ., Madison. Dept. of Agronomy.
or primary bibliographic entry see Field 2I.
76-06147

D. Evaporation and Transpiration

IE HYDROLOGIC POTENTIAL OF UNIT REAS: A BASIS FOR MANAGING WATER SOURCES,
rest Service (USDA), Berkeley, Calif., Pacific uthwest Forest and Range Experiment Station.
r primary bibliographic entry see Field 4D.
76-05620

LATION OF THE CONSUMPTIVE USE EFFICIENT TO THE DESCRIPTION OF GETATION,
ological Survey, Tucson, Ariz.
C. Culler, R. L. Hanson, and J. E. Jones.
ter Resources Research, Vol 12, No 1, p 40-46, ruary 1976. 6 fig, 1 tab, 21 ref.

scriptors: *Evapotranspiration, *Hydrologic lget, *Arid climates, *Arizona, Flood plains, rrelation analysis, *Vegetation, *Consumptive , Transpiration, Analytical techniques, Aerial tography, Remote sensing, Equations.
ntifiers: *Gila River flood plain(Ariz), Con-ptive use coefficient.

Evapotranspiration from three reaches of the Gila River flood plain in Arizona was measured by the water budget during 1963-1971. Initially, the vegetation consisted of salt cedar and mesquite with densities of canopy ranging from 10 to 100%. The phreatophytes were removed in stages during 1967-1971. Perennial grass seed was applied but did not become established, and the postclearing vegetation was primarily annuals. Comparison of the evapotranspiration data from various reaches and comparison of data from before and after clearing required the application of an empirical equation. A consumptive use coefficient related to the description of vegetation was applied to an existing potential evapotranspiration equation based on macroclimatic observations. Initially, the vegetation description consisted of plant identification and canopy dimensions obtained by use of black and white aerial photography and ground measurements. In 1967, remote sensing in the form of color infrared aerial photography became available and densitometric interpretation was used to develop a spectral signature as the vegetation descriptor. (Woodard-USGS)
W76-05843

MAPS OF THE ELEMENTS OF THE HYDROLOGIC BUDGET OF ASIA,
Akademiya Nauk SSSR, Moscow. Institut Gregrafii.
For primary bibliographic entry see Field 2A.
W76-05934

SURFACE ENERGY BUDGET OF SOME CLIMATIC REGIMES IN WEST AFRICA,
Cape Coast Univ. (Ghana). Dept. of Physics.
For primary bibliographic entry see Field 2B.
W76-06006

ROLE OF PHENYLMERCURIC ACETATE ON STOMATAL REGULATION AND WATER LOSS IN PROSOPIS CINERARIA LINN,
Jodhpur Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 5G.
W76-06011

THE ANNUAL VARIATION IN YIELD OF PASTURES IN THE SEASONALLY DRY TROPICS OF QUEENSLAND,
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Pastoral Research Lab.
For primary bibliographic entry see Field 3F.
W76-06016

RATIO BETWEEN EVAPOTRANSPIRATION FROM LYSIMETERS AND EVAPORATION FROM SMALL EVAPORIMETERS USING 2- AND 3- HOUR PERIODS OF MEASUREMENT,
Department of Agriculture, Summerland (British Columbia). Research Station.
J. C. Wilcox, and W. K. Sly.
Can J Plant Sci. 54(3): 559-564. 1974.

Descriptors: *Evapotranspiration, *Lysimeters, *Evaporation, Measurement, Instrumentation, *Evaporimeters, *Bromegrass, Regression analysis.

Evaporation (E) was measured from 2 types of small evaporimeters, and potential evapotranspiration (PET) from lysimeters containing bromegrass (Bromus inermis Leyss). Under complete vegetative cover and with soil moisture content maintained within the range 100-60% available water capacity, evapotranspiration occurred at the potential rate. Records of E, PET and meteorological parameters were taken every 2 or 3 h from dawn to dusk and once overnight, and hourly means were determined. Second-degree polynomial regressions indicated a marked increase in PET/E as E increased. This was found by multiple regression to be due mainly to differential effects of radiation on E and PET. Such differential effects were attributed primarily to the effects of light on stomatal opening; hence on PET more than on E. No significant diurnal effects on E, PET or PET/E were found that could not be attributed to variations in radiation temperature, wind and dew point.--Copyright 1975, Biological Abstracts, Inc.
W76-06029

EFFECT OF DEPTH AND SALINITY OF GROUND WATER ON EVAPORATION AND SOIL SALINIZATION,
Central Soil Salinity Research Inst., Karnal (India).
D. R. Sharma, and S. S. Prihar.
Indian J Agric Sci. 43(6): 582-586. 1973.

Descriptors: *Salinity, Groundwater, *Evaporation, *Saline soils, Depth, Loam, *Water table, Soil.
Identifiers: Depth, Evaporation, Ground, Salinity, Salinization, Soil, Water.

In a controlled study with soil columns, the evaporation from a sandy-loam soil with water table at 50 cm or more was not influenced by an evaporation of 8.8-16 mm a day from a US Weather Bureau class-A open-pan evaporimeter. The maximal evaporation from soil Y(mm) was related with the depth of the water table, X(cm), by the equation $X = 149.2 - 150 \log Y$. The effect of ground-water salinities of EC electrical conductivity 8 and 16 mmhos/cm and ground water depths of 50, 75 and 100 cm on soil salinization during a 13-wk rainless summer period was also investigated. The effect of ground water salinity on the salinization of the top 40-cm soil layer was more pronounced with shallower water table than with deeper water table.--Copyright 1975, Biological Abstracts, Inc.
W76-06036

EVAPORATION CHARACTERISTICS OF THREE FINE-TEXTURED TARAI SOILS UNDER VARIOUS EVAPORATION POTENTIALS,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science.
B. P. Ghildyal, and R. P. Tripathi.
Indian J Agric Sci. 43(7): 704-707. 1973.

Descriptors: *Evaporation, Soils, Soil types, *Soil texture.
Identifiers: *India, *Tarai soils.

A laboratory study was conducted to compare the evaporation of water and distribution of salts under 3 evaporation potentials (daily evaporation from free water surface), 0.35, 1.2 and 1.6 cm/day, from initially saturated soil. Clay-loam, silty clay-loam and loam soils of Pantnagar farm (India) were taken for the study. Cumulative evaporation increased with an increase in the evaporation potentials. The 1st stage of drying was solely dependent on the external evaporative conditions. The falling rate of evaporation indicates that the transmission properties of soils were the limiting factor of evaporation only after the 1st stage of drying. Though the first stage of drying was maintained for longer time at lower evaporation potential (0.35 cm/day), the highest evaporation potential (1.6 cm/day) always resulted in maximum water loss and greater salt accumulation in the surface layers of the soils.--Copyright 1975, Biological Abstracts, Inc.
W76-06037

CLIMATIC WATER BALANCE AT HISSAR,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 2B.
W76-06041

ECO-PHYSIOLOGICAL STUDIES ON DESERT PLANTS: IX. TYPES OF TRANSPIRATION CURVES OF ZILLA SPINOSA PRANTL UNDER NATURAL CONDITIONS,
Cairo Univ., Giza (Egypt). Dept. of Botany.
K. H. Batanouny.
Flora (Jena). 163(1/2), p 1-6, 1974.

Descriptors: *Desert plants, *Plant physiology, *Transpiration, Arid climates, Moisture, Soils.
Identifiers: *Zilla-Spinosa.

The daily march of the transpiration rate of Z. spinosa was studied under desert conditions in different months. The following types of transpiration curves were distinguished: dome-shaped curve obtained under mild climatic conditions and relatively considerable water supply; single-peaked curve, which is parallel to the evaporation curve. This was obtained under relatively good water supply and high evaporating power of the atmosphere; single-peaked curve with an early maximum. This was observed under unfavorable climatic and edaphic conditions; and 2-peaked curve obtained under unfavorable climate and edaphic conditions. (See also W74-12743; W73-10364; W73-03116; W73-02093; W73-00176)--Copyright 1974, Biological Abstracts, Inc.
W76-06123

2E. Streamflow and Runoff

LINE MOTION AND WATER CURRENT DISC SENSOR,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
For primary bibliographic entry see Field 7B.
W76-05539

FLOOD ROUTING IN CHANNEL SYSTEMS WITH ALLOWANCE FOR BANK REGULATION,
Latvian Scientific Research Inst. of Hydraulic Engineering and Reclamation, Jelgana (USSR).
For primary bibliographic entry see Field 4A.
W76-05668

THE 1973 MISSISSIPPI RIVER BASIN FLOOD: COMPILATION AND ANALYSES OF METEOROLOGIC, STREAMFLOW, AND SEDIMENT DATA,
National Weather Service, Silver Spring, Md.; and Geological Survey, Reston, Va.
E. H. Chin, J. Skelton, and H. P. Guy.
Available from Supt. of Documents, GPO, Wash, D.C. 20402, Price $7.10. Geological Survey Professional Paper 937, 1975. 137 p, 74 fig, 9 plates, 12 tab, 32 ref.

Descriptors: *Floods, *Mississippi River basin, *Hydrologic data, *Flood data, Streamflow, Sediment transport, Flood profiles, Meteorological data, Rainfall-runoff relationships, Gaging station, Flow measurement, Peak discharge, Sediment yield, Particle size, Sediment distribution.
Identifiers: *Mississippi River flood(1973).

The severe 1973 spring flood in the Mississippi River basin set new records for consecutive days above flood stage for most main-stem stations from southern Iowa to Louisiana. Peak stages and discharges far exceeding the estimated values for the 100-year flood occurred in April 1973 on many tributaries in Wisconsin, Iowa, Illinois, and Missouri. Described in this report are the meteorological setting of the flood, an account of the general characteristics of associated precipitation, and an analysis of a sample of significant precipitation events with return periods exceeding 100 years. The storm of April 19-21, 1973, with precipitation centered in northern Missouri, is analyzed as a case study. An estimation of evapotranspiration based on relevant meteorological factors indicates a probable reduction of such loss during the flood episode. Also included are summaries of stream stages, discharges, sediment data, and flood volumes for gaging stations where outstanding flood events occurred. The recurrence interval of the event is shown for many of the peaks and volumes. Flood-profile data for the main stem and selected tributary streams are included. (Woodard-USGS)
W76-05860

CORRECTION OF BIAS IN THE ESTIMATION OF THE COEFFICIENT OF SKEWNESS,
Institut National de la Recherche Scientifique, Rimouski (Quebec).
B. Bobee, and R. Robitaille.
Water Resources Research, Vol. 11, No. 6, p 851-854, December 1975. 2 fig, 4 tab, 2 ref.

Descriptors: *Probability, *Distribution, *Statistical methods, *Hydrologic data, Analytical techniques, Methodology, *Estimating.
Identifiers: Coefficient of skewness, Method of moments, Pearson type 3 distribution, Weibull distribution, Population skewness, *Skew coefficient.

The mean, variance, and coefficient of skewness are generally used when a three-parameter distribution is fitted by the method of moments. Because of the large sampling errors inherent in a skew coefficient calculated from small samples, a generalized or average skew coefficient is sometimes used in lieu of the value computed for a single site. The average of the skew values computed by the method of moments is a biased estimate of the population skewness. Results available so far indicate that the correction factor is a function not only of the sample size but also of the skew and the underlying distribution. A relation was developed between the population skewness and the average of the skew values computed by the method of moments in the case of Pearson type 3 distribution. For lognormal and Weibull distributions, these relations were different. Thus, the relation was shown to depend on the underlying distribution. (Singh - ISWS)
W76-05910

USING PARAMETRIC MODELS OF RUNOFF TO IMPROVE PARAMETER ESTIMATES FOR STOCHASTIC MODELS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
D. I. Carey, and C. T. Haan.
Water Resources Research, Vol. 11, No. 6, p 874-878, December 1975. 2 tab, 9 ref.

Descriptors: *Synthetic hydrology, *Streamflow, *Parametric hydrology, *Stochastic processes, Storm runoff, Water resources development, Model studies, *Estimating.
Identifiers: *Model parameter estimates, Extension of existing runoff records, Improving stochastic models.

The problem of evaluating and improving stochastic model parameter estimates was examined. A methodology was described for evaluating the ability of a parametric runoff model to improve short-record estimates of stochastic model parameters by extension of existing runoff records. In an example, a particular parametric runoff model was studied. This parametric model was found to improve annual stochastic model parameter estimates significantly. The type of parametric model used in improving stochastic model parameters depends on the inputs required and the available data. A parametric model for which few inputs are needed is less restricted by lack of available data but will generally give results which are less accurate than those of a model which requires a great number of inputs. Owing to these limitations, there will exist runoff records of length beyond which historical data will give better estimates of stochastic model parameters than any extended record obtained from the parameters model. Once the capabilities of a parametric model are determined to be sufficient for a given problem, it may serve as a powerful tool in reducing the uncertainty of stochastic model parameter estimates. (Morris-ISWS)
W76-05911

DISCHARGE EQUATIONS FOR HS, H, AND HL FLUMES,
Agricultural Research Service, Stillwater, Okla., Water Conservation Structures Lab.
For primary bibliographic entry see Field 8B.
W76-05918

WIND EFFECTS ON STREAM FLOWS,
Delaware Univ., Newark. Coll. of Marine Studies; and Delaware Univ., Newark. Dept. of Civil Engineering.
J. Wu.
Journal of Hydraulic Research, Vol. 13, No. 4, p 405-423, December 1975. 5 fig, 18 ref.

Descriptors: *Winds, *River flow, *Streamflow, Streams, Discharge(Water), Meanders, Velocity, Hydraulics, Open channel flow, Open channels, Sediment transport.
Identifiers: *Drift current, *Wind stress, Sediment-carrying capacity, Longitudinal wind, Wind resistance, Stream resistance, Meandering channel, Centrifugal force, Velocity distribution, Cross wind.

Wind is an unavoidable natural phenomenon; its effects on stream flows, however, have not been carefully evaluated. Wind blowing over the stream can be divided into two components: the longitudinal wind blowing along the stream and the crosswind blowing across the stream. Two specific effects were discussed: the effect of the longitudinal wind on the stream discharge and the effect of the crosswind on the river meandering. The influence of wind on the stream flow was presented in parametric form. A two-fold possible effect of the wind, wind stress and wind drift, was estimated. The lateral sediment transport carried out by the bottom current is the most vital link for initiation of river meandering. The distinctive feature of a meandering channel is the erosion of the outer bank and the deposition at the inner bank. The wind induces the erosion of the downwind bank and the deposition at the upwind bank. As the cross-section becomes more skewed, the transverse sediment transport intensifies. Once a fully skewed bed is established, the erosion and the deposition continue, even after the driving force no longer exists. Very different flow conditions, environmental and topographical, exist for various rivers. River meandering can be caused by one factor alone, or a combination of mechanisms (Lee-ISWS)
W76-05921

COMPARATIVE ESTIMATE OF ENERGY LOSSES IN BODIES OF WATER, AND QUIET AND TURBULENT FLOWS,
For primary bibliographic entry see Field 8B.
W76-05924

SLOPE RUNOFF AND ITS CHANGE UNDER THE EFFECT OF AGRICULTURAL AND FOREST IMPROVEMENT PRACTICES,
For primary bibliographic entry see Field 4C.
W76-05927

HYDRAULIC COMPUTATION OF A POOL HOLLOW,
N. Ye. Kondrat'yev, and B. K. Trakhtenberg
Soviet Hydrology, Selected Papers, No. 2, p 73-82, 1974. 6 fig, 6 ref. Translated from Transactions of the State Hydrologic Institute (Trudy Gossudarstvennogo Gidrologicheskogo Instituta), No. 216, p 5-18, 1974.

Descriptors: *Meanders, *Model studies, *Geomorphology, Banks, Streams, Rivers, Streamflow, Erosion, Sedimentation, Channels, Mathematical models, Flow, Velocity, Hydraulics.
Identifiers: *Pool hollows.

The first attempts to compute the formation of a pool hollow during free meandering were escribed. The pool problem is becoming of great ractical importance because water intakes, ipeline joints, and other hydraulic structures are ocated in pools. Equally interesting is the new rinciple on which the computations are based. Unlike the usual solutions of hydrodynamic chanel problems, in which the velocity field of a flow determined within rigidly assigned boundaries, he boundaries themselves were determined in this ase. The solution of the problem reduces to first nalyzing a flow unconfined by banks. The elocity field of the flow is determined only by asgning the active forces. The noncorrespondence such a 'free flow' with existing rigid boundaries ads to inconsistencies that produce channel eformations. The data used as a basis for the mputations included numerous aerial photoaphs of the flood plains of meandering rivers. ney made it possible to reconstruct the entire rocess of the horizontal reconstruction of meanrs with time from the remaining traces of side rs. Pilot charts constructed at different times d other large-scale maps served as valuable adtional material. These sources made it possible develop an entirely reliable typical pattern of e horizontal developmet of meanders. (Sims - WS)
76-05931

ATER LEVEL GAUGE,
epartment of the Navy, Washington, D.C. Office the Secretary.
r primary bibliographic entry see Field 7B.
76-05977

F. Groundwater

STORY OF GROUND WATER CONCEPTS,
tional Water Well Association, Worthington, io.
E. Gass.
ter Well Journal, Vol. 30, No. 1, p. 26-27, uary 1976.

scriptors: *History, *Subsurface waters, roundwater movement, Groundwater recharge, ter sources, *Groundwater resources.

cient man's misconceptions of the source and vements of ground water are discussed. The t correct theories of Perrault, Mariotte, Halley Darcy are described. The misconceptions and first correct theories are traced to through their ct on the present ground water situation. iss-NWWA)
6-05551

UIFER EVALUATION USING DEPOSINAL SYSTEMS: AN EXAMPLE IN NORTHNTRAL TEXAS,
es and Moore, Boca Raton, Fla.
). Hall, and L. J. Turk.
und Water, Vol. 13, No. 6, p. 472-483, ember-December, 1975, 15 fig., 3 tab.

criptors: *Hydraulic properties, *Deltas, ter chemistry, Permeability, Aquifer charactics, Hydrochemical properties, Ion ange, *Texas, Groundwater movement, sition(Sediments).
tifiers: Hydrochemical facies, *Depositional ms, Fluvial systems, Hosston formation, el formation, Flow pattern.

Delineation of major depositional systems and their component facies within the Lower Cretaceous Hosston and Hensel Sandstone Formations provides a model for predicting the distribution and chemical composition of water in the aquifer. Two major depositional trends occur in both formations: (1) a dip-oriented meanderbelt fluvial system which supplied sediment to (2) a strike-oriented delta system in the east. The meanderbelt sandstone facies of the fluvial systems and the coastal barrier facies of the delta systems are capable of supplying greater amounts of ground water than the floodbasin, lagoon-marsh-embayment, or prodelta/shelf facies. Chemical analysis of ground water suggests correlation between the hydrochemical facies and depositional facies. Ground water is dominantly of the calcium-magnesium bicarbonate type in the fluvial systems. The chemical character of the water changes downdip to sodium sulfate and sodium bicarbonate types in the delta systems. The change in chemical equilibrium probably occurs as dolomite-rich waters from the fluvial facies percolate downdip and dissolve anhydrite or oxidize pyrite in lagoonal facies within the delta system. Calcium may be exchanged for sodium on the marine clays. (Ukayli-NWWA)
W76-05554

HISTORY OF GROUND WATER DEVELOPMENT,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W76-05556

GROUND WATER IS THE ONLY REAL RESERVE THIS COUNTRY HAS.
For primary bibliographic entry see Field 4B.
W76-05567

COUPLED SATURATED-UNSATURATED TRANSIENT FLOW IN POROUS MEDIA: EXPERIMENTAL AND NUMERIC MODEL,
California Univ., Davis. Dept. of Water Science and Engineering.
J. N. Luthin, A. Orhun, and G. S. Taylor.
Water Resources Research, Vol. 11, No 6, p 973-978, December 1975. 9 fig, 1 tab, 9 ref.

Descriptors: *Porous media, *Model studies, *Free surfaces, *Unsaturated flow, *Unsteady flow, Numerical analysis, Analytical techniques, Flow nets, Groundwater, Groundwater movement, Water wells, Potential flow, Moisture content, Computer models, Dupuit-Forchheimer theory, Finite element analysis.
Identifiers: *Finite-difference techniques, Sand tank model, Sector tank model, Saturated-unsaturated flow.

Experimental data were obtained from a sector tank for the transient flow toward a well. The data included both the saturated and the unsaturated flow region. The data were used to verify the accuracy of a computer solution using an implicit numerical procedure. Agreement between the two sets of data was good. The computer solution can be adapted to a wide variety of groundwater flow problems. (Prickett - ISWS)
W76-05684

NORMAL MODE ANALYSIS OF THE LINEAR EQUATION OF GROUNDWATER FLOW,
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown.
Water Resources Research, Vol 11, No 6, p 979-987, December 1975. 6 fig, 1 tab, 3 ref.

Descriptors: *Base flow, *Mathematics, *Numerical analysis, *Computer models, *Unsteady flow, Equations, Groundwater movement, Confined water, Diffusion, Theis equation, Model studies, Simulation analysis, Hydrology.
Identifiers: *Normal mode analysis, Linear equations, Finite differences, ADI method, Crank-Nicholson method, Diffusion equation.

The study of groundwater flow, given equations of motion and boundary conditions which are mathematically linear, can be analyzed by using a normal mode approach. For the fully continuous case the simplest example is the familiar double Fourier analysis. Analogous results exist for the semidiscrete case, in which only time is treated as a continuous variable, and a method can be given for computing normal modes whose corresponding recession factors lie within prescribed ranges. One application of this approach suggested an empirical form for the base flow component of a stream hydrograph. The fully discrete case was also treated and provided a convenient basis for the comparison of the more common approximations to the solution of the transient groundwater flow equation. In particular, it was shown why the study of model problems does not provide a useful guide to the accuracy of the alternating direction implicit method applied to more general situations. (Prickett - ISWS)
W76-05685

FORECASTING WATER LEVELS IN AQUIFERS BY NUMERICAL AND SEMIHYBRID METHODS,
Technion-Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
E. Hefez, U. Shamir, and J. Bear.
Water Resources Research, Vol. 11, No. 6, p 988-992, December 1975. 3 fig, 3 tab, 13 ref.

Descriptors: *Forecasting, *Water levels, *Aquifers, *Numerical analysis, *Hybrid computers, Model studies, Computer models, Resistance networks, Equations, Boundaries(Surfaces), Artesian heads, Transmissivity, Recharge, Water wells, Analog models.
Identifiers: *Noniterative alternating direction implicit method, Cell models, Computation time.

Two methods which employ a cell model for forecasting water levels in aquifers were compared: the (noniterative) alternating direction implicit (ADI) finite difference method and a semihybrid iterative method, in which a resistor network is the analog part. By using simulation of the semihybrid method it was concluded that this method requires a larger computational effort than the ADI method. (Visocky - ISWS)
W76-05686

AN IDENTIFICATION APPROACH TO SUBSURFACE HYDROLOGICAL SYSTEMS,
California Univ., Berkeley. Dept. of Civil Engineering.
N. Distefano, and A. Rath.
Water Resources Research, Vol. 11, No. 6, p 1005-1012, December 1975. 10 fig, 1 tab, 36 ref.

Descriptors: *Mathematical models, *Aquifer characteristics, *Transmissivity, Model studies, Subsurface waters, Aquifers, Groundwater, Mathematical studies, Observation wells, Hydrographs.
Identifiers: *Groundwater modeling, *Subsurface hydrological systems, Confined isotropic aquifer.

A method for the optimal determination of the transmissivity function in a model of a horizontal two-dimensional saturated aquifer, using time histories of the heads at a number of observation points, was developed. In this method the transmissivity function was assumed to be represented by a continuous spline surface over the entire domain of the aquifer and was given in terms of unknown nodal values disposed over a rectangular grid. These nodal values were then determined by requirements of optimality, i.e.,by minimination of an error functional denoting the deviations of the observed and predicted heads at several strategically distributed observation wells. The method

was complemented by using a hierarchical identification approach which consists of gradually increasing the number of nodal values employed in the analytical representation of the transmissivity function. Finally, a numerical example involving the determination of the transmissivity map of an aquifer by employing simulated head histories was presented to illustrate the feasibilty of the proposed method. (Sanderson - ISWS)
W76-05688

DETERMINING AQUIFER COEFFICIENTS FROM RESIDUAL DRAWDOWN DATA,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vanden Berg.
Water Resources Research, Vol. 11, No. 6, p 1025-1028, December 1975. 2 fig, 1 tab, 4 ref.

Descriptors: *Aquifer characteristics, *Transmissivity, *Storage coefficient, *Least squares method, *Drawdown, Hydraulics, Aquifers, Groundwater, Permeasbility , Porous media, Mathematical studies, Theis equation, Numerical analysis.
Identifiers: *Aquifer coefficients, *Residual drawdown data, Recovery data.

Hantush's equation for the drawdown in a leaky, infinite aquifer, adapted to the residual drawdown, was used to obtain a least sum of squares fit to the residual drawdown measurements in an observation well by iteratively adjusting the transmissivity, storativity, and leakage factor. First estimates for the least squares method were obtained by first fitting the equation, with a fixed high value of the leakage factor, to two points of the data; this was followed by a number of fits to three points, each fit yielding a set of values for the three aquifer coefficients; the set which yielded the least sum of squares was selected as first estimate to the main routine. An application to data from a pump test at Chatham, New Brunswick, was shown as an example. (Sanderson - ISWS)
W76-05689

VERTICAL ELECTRICAL RESISTIVITY SOUNDINGS TO LOCATE GROUND WATER RESOURCES: A FEASIBILITY STUDY,
Old Dominion Univ., Norfolk, Va. Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 4B.
W76-05835

LAND SUBSIDENCE AND AQUIFER-SYSTEM COMPACTION IN THE SAN JACINTO VALLEY, RIVERSIDE COUNTY, CALIFORNIA--A PROGRESS REPORT,
Geological Survey, Sacramento, Calif.
B. E. Lofgren.
Journal of Research of the U.S. Geological Survey, Vol 4, No 1, p 9-18, January-February 1976. 10 fig, 16 ref.

Descriptors: *Land subsidence, *Aquifer systems, *Compaction, *Hydrogeology, *California, Hydrologic data, Geology, Water level fluctuations, Faults(Geologic), Seismology, Evaluation.
Identifiers: *San Jacinto Valley(Calif).

Widespread subsidence continues in the San Jacinto structural trough in Riverside County, Calif., as water levels continue to decline. Subsidence is due principally to the compaction of water-bearing deposits as effective stresses are increased by artesian-head decline. Other possible contributory causes of subsidence are (1) local or regional tectonic adjustments and graben downfaulting, (2) natural compaction of deep water-bearing deposits below the bottom of well casins, and (3) continuing compaction of surficial deposits due to causes other than artesian-head decline. An analysis of 4 years of correlative records of water-level, extensometer, and land-surface changes suggests three types of vertical ground movement occurring at the recorder site near the San Jacinto reservoir site. The reservoir was drained in October 1973. Listed in descending order of magnitude these are (1) an elastic undulation of the land surface of about 0.06 ft per year in close response to the roughly 50 ft of seasonal water-level fluctuations, (2) a long-term permanent compaction of the deposits in the 0-1,237-ft zone of about 0.04 ft per year, and (3) a deep settlement of deposits below the 1,237-ft extensometer anchor of 0.01-0.02 ft per year, probably caused by continuing downfaulting in the graben trough. (Woodard-USGS)
W76-05847

A DIGITAL-COMPUTER MODEL FOR ESTIMATING HYDROLOGIC CHANGES IN THE AQUIFER SYSTEM IN DANE COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
R. S. McLeod.
Wisconsin Geological and Natural History Survey, Madison, Information Circular No 30, November 1975. 40 p, 24 fig, 4 tab, 8 ref.

Descriptors: *Water resources development, *Groundwater resources, *Water supply, *Projections, *Model studies, Digital computers, Water yield, Drawdown, Groundwater recharge, Surface-groundwater relationships, Streaflow, Data collections, Evaluation, Water utilization, Water demand, *Wisconsin
Identifiers: Dane County(Wisc).

The extensive use of groundwater for water supply within Dane County, Wisconsin, has resulted in groundwater level declines and reductions in streamflow. Digital-computer modeling techniques were used to estimate hydrologic changes in the aquifer system that would be caused by continued development. The system was modeled as a two-aquifer system consisting of a confined sandstone aquifer overlain by a leaky unconfined aquifer and underlain by impermeable bedrock. The physical properties of the aquifer system needed for the model were approximated using aquifer-test data and well-log data and by matching observed hydrologic changes in the system with corresponding changes computed by the model. Computed hydrologic changes do not represent a serious depletion of the available groundwater supply for the foreseeable future Maximum added regional declines in groundwater levels (drawdowns) from 1970 to 1990 were computed to be approximately 10 feet (3 metres) in the unconfined aquifer and approximately 40 feet (12 metres) in the confined aquifer. It is computed that for the same period the average annual streamflow from the upper Yahara River basin would be reduced by approximately 29 cfs (0.82 cu m/sec). These changes are computed based on estimated development trends for the confined sandstone aquifer. (Woodard-USGS)
W76-05851

EVALUATION OF DATA AVAILABILITY AND EXAMPLES OF MODELING FOR GROUNDWATER MANAGEMENT ON CAPE COD, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 4B.
W76-05856

FLORIDAN AQUIFER IN NORTHEAST FLORIDA--THREE MAPS--HARDNESS OF WATER, CHLORIDE CONCENTRATION, AND POTENTIOMETRIC SURFACE, MAY 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-05859

GEOHYDROLOGY OF THE EVANGELINE AND JASPER AQUIFERS OF SOUTHWESTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
M. S. Whitfield, Jr.
Louisiana Department of Public Works, Baton Rouge, Water Resources Bulletin No. 20, 1975. 72 p, 11 fig, 9 plates, 2 tab.

Descriptors: *Geologic mapping, *Aquifers, *Louisiana, *Groundwater resources, *Water quality, Data collections, Well data, Aquifer characteristics, Water yield, Water levels, Water utilization, Water supply, Groundwater movement, Groundwater recharge, Hydrogeology.
Identifiers: Southwestern Louisiana, *Evangeline aquifer(La), *Jasper aquifer(La).

In southwestern Louisiana, interbedded continental and marine deposits form a southeastward-thickening wedge of unconsolidated sediments that contain the fresh-water-bearing zone. These sediments range in age from late Tertiary to Pleistocene. The upper Tertiary deposits comprise the Evangeline and Jasper aquifer systems. These aquifers are capable of supplying large quantities of water that is of excellent quality to meet expanding industrial and municipal needs. Fresh groundwater occurs to a maximum depth of approximately 2,200 ft below sea level in the Evangeline aquifer and approximately 3,100 ft below sea level in the Jasper aquifer. Fresh water occurs in the Evangeline aquifer throughout the area of investigation except in central St. Landry Parish and in a small isolated area surrounding the Pine Prairie salt dome in Evangeline Parish. Fresh water occurs in the Jasper aquifer in most of Beauregard Parish and in the northwestern part of Allen Parish. Water from the Evangeline and Jasper aquifers is a sodium bicarbonate type, generally very soft (less than 40 milligrams per litre), and low in dissolved-solids concentration. Locally, the water may be hard, and iron or fluoride may occur in objectionable concentrations. Water from the upper part of the Jasper aquifer is similar in chemical quality to water from the Evangeline aquifer. Water from the lower part of the Jasper aquifer, however, generally is lower in iron concentration. (Woodard-USGS)
W76-05861

AVAILABILITY OF GROUND WATER IN THE ANDROSCOGGIN RIVER BASIN, NORTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N.H.
For primary bibliographic entry see Field 7C.
W76-05862

PUMPING-TEST ANALYSIS USING A DISCRETE TIME-DISCRETE SPACE NUMERICAL METHOD,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-05913

GROUNDWATER STUDY OF A VOLCANIC AREA NEAR BANDUNG, JAVA, INDONESIA,
Cowiconsult Ltd., Copenhagen (Denmark).
For primary bibliographic entry see Field 4B.
W76-05914

2G. Water In Soils

INTERACTIONS OF MERCURY WITH AQUATIC AND EDAPHIC ENVIRONMENTS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5B
W76-05601

GUIDELINES FOR CHARACTERIZING NATURALLY UNSTABLE OR POTENTIALLY UNSTABLE SLOPES ON WESTERN NATIONAL FORESTS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station

r primary bibliographic entry see Field 4D.
76-05621

ATIAL VARIABILITY OF IN SITU UNSATU-TED HYDRAULIC CONDUCTIVITY OF ADDOCK SANDY LOAM,
rth Dakota State Univ., Fargo. Dept. of Soils.
O. Carvallo, D. K. Cassel, J. Hammond, and A. ıer.
l Science, Vol. 121, No. 1, p 1-8 January 1976. 2 2 tab, 13 ref.

scriptors: *Unsaturated flow, *Hydraulic con-tivity, *Soil water movement, *On-site in-tigations, *Loam, *North Dakota, Tensiome-, Permeability, Porosity, Drainage, Infiltra-, Percolation, On-site tests, On-site data col-ions, Instrumentation, Moisture content.
ntifiers: *Soil water pressure, Soil water con-, Lacustrine materials, Maddock sandy loam.

saturated soil hydraulic conductivity (K) versus th was measured in situ in five infiltration plots hin a 0.01 hectare area on a soil developed from strine materials in a glacial lake bed. Sufficient er was allowed to infiltrate each plot to wet the profile to 152 cm. The soil surface was ered to prevent evaporation and during the en-g drainage period, soil water pressure was itored with triplicate tensiometers at each h of 15, 30, 45, 61, 91, 122, and 152 cm. Soil er characteristic data determined on triplicate s taken from the same depth as the tensiome-cups, were used in conjunction with the soil er pressure head data to compute the hydraulic luctivity. Significant spatial variability of raulic conductivity at the 1% level was found. ddition, K significantly varied with depth, at 1% level, generally increasing, due to the rogeneous nature of soil in the vertical ction. Hydraulic conductivity as a function of sity was computed for each site by the ified Green and Corey method. Agreement of e theoretical K values with those measured in depended on the soil water content at which matching factor was selected. Agreement een methods was best when the matching fac-was selected at the lowest water content at h K was measured in the field for that particu-oil depth. (Sanderson-ISWS)
-05670

E RELATIONS BETWEEN FOREST ER AND GROWTH OF SITKA SPRUCE POORLY DRAINED SOILS,
n's Univ., Belfast (Northern Ireland). Dept. gricultural and Food Chemistry.
rimary bibliographic entry see Field 2I.
05687

EMENT OF TRACERS THROUGH SOIL,
rio Ministry of the Environment, Toronto. ed Science Section.
rimary bibliographic entry see Field 5B.
05701

TRANSPORT IN SOIL PROFILES WITH ICATION TO IRRIGATION RETURN V, THE DISSOLUTION AND TRANSPORT YPSUM IN SOILS,
ado State Univ., Fort Collins. Dept. of nomy.
rimary bibliographic entry see Field 5B.
05836

TE TRAVEL-TIME ESTIMATES FOR DRAINED FIELDS: I. THEORY,
rnia Univ., Riverside. Dept. of Soil Science gricultural Engineering.
imary bibliographic entry see Field 5B.
05904

SOLUTE TRAVEL-TIME ESTIMATE FOR TILE-DRAINED FIELDS: II. APPLICATION TO EXPERIMENTAL STUDIES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-05905

RECLAMATION OF SOILS CONTAMINATED WITH RADIOACTIVE STRONTIUM,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5G.
W76-05906

EFFECT OF SURFACE APPLIED SULFURIC ACID ON WATER PENETRATION INTO DRY CALCAREOUS AND SODIC SOILS,
Arizona Univ., Tuscon. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5G.
W76-05907

FACTORS INFLUENCING INFILTRATION AND SEDIMENT PRODUCTION OF SEMIARID RANGELANDS IN NEVADA,
Texas A and M Univ., College Station. Dept. of Range Science.
W. H. Blackburn.
Water Resources Research, Vol. 11, No. 6, p 929-937, December 1975. 3 fig, 6 tab, 27 ref.

Descriptors: *Infiltration, *Erosion, *Sediment yield, *Watersheds(Basins), *Plant morphology, *Nevada, Soil structure, Antecedent moisture content, Simulated rainfall, Field capacity, Silts, Arid lands, Semiarid climates.
Identifiers: Dune interspace soils, Vesicular horizons.

Simulated rainfall was used to study infiltration rates and sediment production of 28 plant communities and soils of five watershed areas in central and eastern Nevada. Two antecedent soil moisture conditions were used: soil initially air dry and initially at field capacity. Infiltration rates and sediment production of the various soils are largely controlled by extent and surface morphology of dune interspace soils. Pertinent factors are the depth of surface horizon, percent of carbon, pH, bulk density, and percent silt in the dunes. Vesicular horizons are unstable in dune interspace surface soils. These horizons seldom occur in coppice dunes or in well-aggregated dune interspace soils. Infiltration rate is negatively related, and sediment production positively related to the occurrence and morphology of vesicular horizons. More sediment is produced from soils with antecedent moisture initially at field capacity than from initially dry soil because of the instability of vesicular horizons when the soils were saturated. (Singh-ISWS)
W76-05912

SOIL MICROBES,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
W. B. Bollen.
For sale by the Superintendent of Documents U. S. Government Printing Office, Washington, D.C. 20402. In: Environmental Effects of Forest Residues Management in the Pacific Northwest. State of Knowledge Compendium. USDA Forest Service Technical Report, PNW-24, p. B-1 to B-41 1974. 11 tab, 5 fig, 89 ref.

Descriptors: *Soil microorganisms, *Cycling nutrients, Chemical reactions, Temperature, Aeration, Hydrogen ion concentration, Forest soils, Microenvironment, Microbial degradation, Forest management.
Identifiers: Residue decomposition.

Interactions between soil microbes and forest residues are controlled by six environmental factors: water, temperature, aeration, pH, food supply, and biological interrelationships. A change in one induces change in others. Burning drastically affects all six but is especially unfavorable in terms of nitrogen loss and effects on soil physical properties. Microbial decomposition of residues, in contrast, recycles the nitrogen and can result in improved soil physical properties. Microbial activity can be enhanced by reducing particle size of residues, by providing good contact between residue fragments and soil, and by adding nitrogen by fertilization or establishment of plants with nitrogen-fixing nodules. Petroleum products, biocides, or fire retardants appear unlikely to significantly affect soil microbial activity or residue decomposition when used at recommended rates. Forest residues combined with soil microbes offer promise for disposal ofsewage waste water and decomposable garbage. (Forest Service)
W76-05935

SOIL PROCESSES AND INTRODUCED CHEMICALS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-05936

SOIL STABILITY AND WATER YIELD AND QUALITY,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-05937

WATER MOVEMENT WITHIN THE ROOT ZONE OF IRRIGATED AND NONIRRIGATED GRAIN SORGHUM,
South Dakota State Univ., Brookings. Dept. of Plant Science.
L. R. Stone, and M. L. Horton.
Journal of Soil and Water Conservation, Vol. 30, No. 6, p 292-293, November-December 1975. 3 fig, 7 ref. OWRT A-035-SDAK (1).

Descriptors: *Soil water movement, *Root zone, *Grain sorghum, *Irrigation, Solutes, Nutrients, Grains(Crops), Unsaturated flow, Evapotranspiration, Loam, Tensiometers, Potentiometric level, Hydraulic conductivity, Darcys law, Depth, Salts, Soil profiles, Perched water.
Identifiers: *Great Bend silt loam.

Water movement and redistribution are important in supplying nutrients and water to plants. Water movement and redistribution during August 1972 in fields of irrigated and nonirrigated grain sorghum were determined. Soil water flux in the non-irrigated area was upward in all soil-depth intervals during the study. Upward flux in the 15- to 30-, 30- to 50-, and 50- to 70- cm depths decreased with time. Upward flux in the 130- to 150-cm depth reached a maximum of 0.17 cm per day and then remained near 0.11 cm per day. Immediately after irrigation, flux was downward in all soil depth intervals in the irrigated sorghum. Flux in the 130- to 150-cm depth remained downward. Flux in the 15- to 30-, 30- to 50-, and 50- to 70-cm depths turned upward within one week after irrigation. (Visocky - ISWS)
W76-05994

CARBON DIOXIDE EVOLUTION FROM VIRGIN AND CULTIVATED SOIL AS AFFECTED BY MANAGEMENT PRACTICES AND CLIMATE,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
E. DeJong, H. J. V. Schappert, and K. B. Macdonald.
Can J Soil Sci. 54(3): 299-307. 1974.

Descriptors: Soil properties, *Climates, *Soil management, *Clays, Respiration, *Soil physical

properties, *Soil chemical properties, *Carbon dioxide, *Soil gases.

Soil respiration during the growing season was calculated from CO2 profiles in a heavy clay soil under native grass and on cultivated plots. Soil respiration of the native grass plots was correlated with moisture content and temperature of the surface soil. However, the correlation accounted for only 1/3 of the observed variation in soil respiration and could not explain the large difference between 2 growing seasons. Addition of mineral N decreased soil respiration and irrigation increased it. Total soil respiration on the cultivated plots was higher than on the native grassland. On the wheat plots, soil respiration was significantly correlated with soil moisture but not with temperature; the reverse was true for the fallowed plots. Soil respiration during 1 May-1 Sept. on the native grassland was highly correlated with rainfall and the number of days with rain in excess of 5 mm. The number of wetting and drying cycles in the soil was mainly responsible for the annual variation in soil respiration. From comparison with data on shoot production, it appears that soil respiration exceeds net production in wet years and that the opposite is true in dry years.--Copyright 1975, Biological Abstracts, Inc.
W76-06003

EFFECT OF DEPTH AND SALINITY OF GROUND WATER ON EVAPORATION AND SOIL SALINIZATION,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2D.
W76-06036

EVAPORATION CHARACTERISTICS OF THREE FINE-TEXTURED TARAI SOILS UNDER VARIOUS EVAPORATION POTENTIALS,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science.
For primary bibliographic entry see Field 2D.
W76-06037

RESPONSE OF SOIL TESTACEA TO SOIL MOISTURE FLUCTUATIONS,
Calgary Univ. (Alberta). Dept. of Biology.
J. D. Lousier.
Soil Biol Biochem. 6(4): 235-239. 1974.

Descriptors: *Soil moisture, *Rocky Mountain Region, Trees, Forest management.
Identifiers: *Aspen, *Testacea, Woodlands.

As soil moisture increased in a Rocky Mountain aspen woodland soil-litter system, all species of Testacea recorded showed a significant increase in number of active individuals and a proportionate sugnificant decrease in the number of cysts. The trends were less evident in the A0L layer because of low variation in moisture content compared to the A0F and A0H layers. At higher soil moisture the larger species present (>60 mm) tended to retain a larger proportion of living individuals as cysts than did the smaller forms (< 60 mm) which numerically dominated the population.--Copyright 1975, Biological Abstracts, Inc.
W76-06038

THE MICROENVIRONMENT OF CLIMACIUM AMERICANUM,
Platte Technical Community Coll., Columbus, Nebr.
R. D. Sholl, and J. D. Ives.
Trans Ill State Acad Sci. 66(3/4): 97-104. 1973.

Descriptors: *Mosses, Environment, *Evaporation, Temperature, Humidity, Soil temperature, Soil moisture, Organic matter.
Identifiers: Climacium-Americanum.

Maximum and minimum temperatures and relative humidity of the air at 1 cm above the soil surface, soil temperature, potential evaporation rate, soil moisture and organic matter present in the soil were measured for 5 plots that appeared to be very similar habitat types. The plots on which C. americanum occur were found to have relatively low maximum and minimum temperatures, high relative humidity of the air layer directly over the plots, relatively low rates of potential evaporation, relatively low soil temperatures, and soils that are moderately acidic. Each of the plots on which C. americanum does not occur was found to be notably different in terms of one or more of the environment factors measured than the plots where C. americanum is present.--Copyright 1974, Biological Abstracts, Inc.
W76-06045

THE PERFORMANCE OF SURFACE AND SUBSURFACE DRAINAGE OF HEAVY CLAY SOILS IN YUGOSLAVIA,
J. M. Groot.
Neth J Agric Sci. 22(3), p 160-174, 1974.

Descriptors: *Soil, Soil water movement, Subsurface drainage, *Clays, Rainfall, Permeability.
Identifiers: Cropping, Reclamation, Yugoslavia, Sava River.

Field drainage methods were investigated on soils in the Sava River Basin, Yugoslavia, which have a well-permeable topsoil of about 0.3 m underlain by an impermeable subsoil. The systems tried were tube drainage at about 1.0 m depth, surface drainage with open field ditches and mole drainage. Under rainfall, horizontal flow through the topsoil takes place. The formulas for both the steady and non-steady state that apply to this flow are presented. These formulas together with field observations about accessibility of the fields have rendered it possible to derive the drainage requirements for the climatological conditions and the soils as prevalent in the area. Partly because of mechanization subsurface drains are preferred; subsurface drains provide better drainage than surface drains, particularly during reclamation and the 1st years of cropping. Under the soil conditions prevailing in the area, flow over the surface is likely to occur. The factors determining the peak discharges of field drains are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-06116

BEHAVIOUR OF SOME PHOSPHATIC FERTILIZERS IN WATER,
Khatauli Manure Mills, Khatauli (India).
For primary bibliographic entry see Field 5B.
W76-06139

APPLICATION OF INFRARED SPECTROSCOPY TO ERODIBILITY STUDIES OF THE SOIL,
Allahabad Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 2J.
W76-06140

STUDIES ON DEPTH AND QUALITY OF WATER ON SOIL SALINIZATION: BEHAVIOUR OF ANIONS IN THE SOIL PROFILE WITH REFERENCE TO THE POSITION OF WATER TABLE,
Central Soil Salinity Research Inst., Karnal (India).
A. K. Bandyopadhya.
J Indian Soc Soil Sci. 21(4), p 485-489, 1973.

Descriptors: Saline soils, Water quality, Anions, Soil profiles, Water table, Calcium, Carbonates, Ions, Bicarbonates.

The behavior of chloride, sulfate and bicarbonate ions in the soil profile with reference to the position of the water table is discussed. A possible explanation of the formation of calcium carbonate concretions in the soils is given.--Copyright 197
Biological Abstracts, Inc.
W76-06141

2H. Lakes

HYDROLOGIC IMPLICATIONS OF CANYO DAM AND RESERVOIR,
National Weather Service Forecast Offi
Washington, D. C.
R. A. Clark.
In: 'Reservoir Impact Study,' p. 4.i-4.
November 1974. 10 fig, 6 tab, 3 ref.

Descriptors: *Reservoir design, *Reservoir ope
tion, Reservoir storage, Inflow, Reserv
leakage, Reservoir evaporation, Reserv
releases, Flood frequency, Flood flow, Tex
Post-impoundment.
Identifiers: *Canyon Reservoir(Texa
Guadalupe River(Texas).

Canyon Dam was designed for the primary p
pose of reducing flood damages in the lo
reaches of the Guadalupe River, Texas. A relati
ly large conservation capacity has been allowed
provide a firm water supply for downstream use
The total capacity for flood control is 354,700 a
feet. The total contributing drainage area at
dam site is 1432 square miles. The study per
during July 1962 through September 1971 utili
precipitation, inflow, evaporation, observ
capacity, and outflow information to determ
the hydrologic impact of the reservoir on the wa
regime of the Guadalupe River. The net lake s
face evaporation is almost equal to the effect
rainfall. When the reservoir is full to the top
conservation storage it represents 22,700 acre f
per year or approximately 5.9% of the conser
tion capacity. The estimated monthly inflow
ranged from 296 acre feet to 151,750 acre feet. T
observed flood peaks on the Guadalupe Ri
were less than 10,000 cfs with the exception of
flood peak of approximately 92,600 cfs occurr
in May 1972 at New Braunfels. Leakage
proved insignificant and the reservoir has had li
or no impact on groundwater levels of the surfa
impact region. (See also W76-04501) (Au
Wisconsin).
W76-05503

EVALUATION OF THE TROPHIC TYPES SEVERAL ALASKAN LAKES BY ASSESSME OF THE BENTHIC FAUNA,
Alaska Univ., College. Inst. of Water Resources
For primary bibliographic entry see Field 5C.
W76-05604

PHOSPHORUS, NITROGEN, AND T GROWTH OF ALGAE IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5C.
W76-05633

CHEMICALLY ENHANCED C02 G EXCHANGE IN A EUTROPHIC LAKE: GENERAL MODEL,
Lamont-Doherty Geological Observato
Palisades, N.Y.
For primary bibliographic entry see Field 5C.
W76-05635

A DESCRIPTION OF THE TROPHIC STAT AND NUTRIENT LOADING FOR LA GEORGE, NEW YORK,
Rensselaer Polytechnic Inst., Troy, N. Y. Fr
Water Inst.
For primary bibliographic entry see Field 5C.
W76-05638

AKE AND SHORE ICE CONDITIONS ON OUTHEASTERN LAKE MICHIGAN IN THE ICINITY OF THE DONALD C. COOK UCLEAR PLANT: WINTER 1973-74,
lichigan Univ., Ann Arbor. Great Lakes esearch Div.
or primary bibliographic entry see Field 2C.
76-05664

EVELOPMENT OF OXYGEN DEFICITS IN 14 OUTHERN ONTARIO LAKES,
ent Univ., Peterborough (Ontario). Dept. of ology.
or primary bibliographic entry see Field 5C.
76-05679

ELECTED WATER-QUALITY DATA FROM ALLEN LEAF LAKE, EL DORADO COUNTY, ALIFORNIA, JUNE THROUGH OCTOBER 74,
ological Survey, Menlo Park, Calif.
r primary bibliographic entry see Field 7C.
76-05848

BLE OF DATA ON WATER QUALITY OF KER LAKE NEAR MOUNT BAKER, ASHINGTON,
ological Survey, Tacoma, Wash.
r primary bibliographic entry see Field 7C.
76-05857

VIRONMENTAL RESPONSES TO THER-AL DISCHARGES FROM MARSHALL EAM STATION, LAKE NORMAN, NORTH ROLINA,
ns Hopkins Univ., Baltimore, Md. Dept of ography and Environmental Engineering.
r primary bibliographic entry see Field 5C.
6-05870

TRODUCTION AND PHYSICAL DESCRIP-ON OF LAKE NORMAN,
ns Hopkins Univ. Baltimore, Md. Dept. of ography and Environmental Engineering.
primary bibliographic entry see Field 5C.
6-05871

ERMAL AND WATER QUALITY CHARAC-RISTICS OF LAKE NORMAN,
ns Hopkins Univ., Baltimore, Md., Dept. of ography and Environmental Engineering.
primary bibliographic entry see Field 5C.
6-05872

E EFFECT OF THERMAL DISCHARGE ON E RATE OF ACCUMULATION OF OR-NIC SUBSTANCES ON GLASS SURFACES MERSED IN LAKE NORMAN,
ns Hopkins Univ., Baltimore, Md. Dept. of graphy and Environmental Engineering.
primary bibliographic entry see Field 5C.
-05875

THIC INVERTEBRATES,
s Hopkins Univ., Baltimore, Md. Dept. of graphy and Environmental Engineering.
primary bibliographic entry see Field 5C.
-05877

CHEMICAL SPECIATION OF PU-239, PU- AND CS-137 IN LAKE MICHIGAN TERS,
nne National Lab., Argonne, Ill. Radiological Environmental Research Div.
rimary bibliographic entry see Field 5B.
05889

DISCHARGE RESIDENCE OF TLD TAGGED FISH,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05898

BODY TEMPERATURE CHANGE CHARACTERISTICS OF LAKE MICHIGAN FISHES,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05899

BODY TEMPERATURES OF FISH FEEDING IN THE POINT BEACH THERMAL DISCHARGE,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05900

GROWTH OF PLUME RESIDENT FISHES IN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05901

EFFECT OF PLUME RESIDENCE ON THE ACCUMULATION OF CS137 BY LAKE MICHIGAN SALMONIDS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05902

PARASITES OF FRESHWATER FISHES. A REVIEW OF THEIR CONTROL AND TREATMENT,
G. L. Hoffman, and F. P. Meyer.
T.F.H. Publications, Inc.: Neptune City, N.J., 1974. 224 p.

Descriptors: *Fish parasites, Freshwater fish, Fish diseases.

This is the first review of the subject since 1928. Included are chapters on methods, conversion information, synopsis of the most widely used treatments, glossary, tables of methods reported with references, toxicity of parasiticides and chemical synonyms. There are 390 references. Most unusual in parasitology is the inclusion of 105 color photographs of fish parasites. This book is intended for fish disease researchers and students, fish pathobiologists, fish culturists and aquarists.--Copyright 1975, Biological Abstracts, Inc.
W76-05953

LAKE WINGRA, 1837-1973: A CASE HISTORY OF HUMAN IMPACT,
Univ. Wis., Madison, Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W76-05997

NEMATODES OF LAKE BALATON: IV. SEASONAL QUALITATIVE AND QUANTITATIVE CHANGES,
Research Inst. for Water Resources Development, Budapest (Hungary). Water Quality and Technology Dept.
For primary bibliographic entry see Field 5C.
W76-06004

LIMNOLOGICAL CHARACTER OF EXPERIMENTAL RESERVOIRS TREATED WITH TRITOX 30% (DDT, DMDT, GAMMA HCH),
National Inst. of Hygiene, Warsaw (Poland). Dept. of Communal Hygiene.
For primary bibliographic entry see Field 5C.
W76-06012

CHANGES IN THE LIMNOLOGICAL FEATURES OF A MEROMICTIC LAKE SUIGETSU DURING THE YEARS, 1926-1967,
Nagoya Univ. (Japan). Water Research Lab.
M. Matsuyama.
J Oceanogr Soc Jpn. 29(4): 131-139. 1973.

Descriptors: Lakes, Limnology, Solinity, Stratification, Chlorides, Salt water, Water pollution sources.
Identifiers: *Meromictic lakes, *Lake Suigetsu(Japan), *Polyhaline coastal lakes.

Changes in the limnological features of a typical meromictic lake, Lake Suigetsu, from 1926-1967, are summarized. Until 1934, the lake was stratified due to the balance between the flushing of fresh water and the intrusion of salt water through a canal by which the lake was connected to a coastal polyhaline lake. Total chloride content of the lake had been within the range of 100-230 x 1000 tons and thermal stratification was well developed. In 1934, another channel was constructed by which the lake was connected to another polyhaline coastal lake. This resulted in the influx of large quantities of salt water (maximum total chloride content of the lake: 790 x 1000 tons), and the characteristics of stratification were altered. After 1951, a 2-layered system was re-established (total chloride content of the lake: 470-620 x 1000 tons), and distinct stratification began to appear.--Copyright 1975, Biological Abstracts, Inc.
W76-06018

ON THE POSSIBILITIES OF AVERAGING THE SEASONAL PATTERN IN KJELDAHL NITROGEN IN A GROUP OF WATER BODIES,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
For primary bibliographic entry see Field 5B.
W76-06019

LIMNOLOGICAL FEATURES OF A TROPICAL IMPOUNDMENT, BHAVANISAGAR RESERVOIR (TAMIL NADU), INDIA,
Hydrobiological Research Station, Madras (India).
For primary bibliographic entry see Field 5C.
W76-06020

ON DIPLOSTOMOSIS OF THE GRASSCARP FRY,
K. Molnar.
Acta Vet Acad Sci Hung. Vol 24 No 1/2 p 63-71. 1974. Illus.

Descriptors: *Trematodes, *Fish parasites, Carp, Fry.
Identifiers: Diplostomosis, Diplostomum spathaceum.

Infestation by cercariae of Diplostomum spathaceum killed 90% of the 3-wk-old, 1.7-2.5 cm long grasscarp (Ctenopharyngodon idella) fry reared in a fingerling pond. The severely diseased hosts harbored an average of 20-25 larvae in the occular lens and 10-15 migrating stages in other parts of the body. Cercarial migration caused hemorrhages, visible externally. Most cercariae established in the eye or adjacent areas were surrounded by proliferative tissue.--Copyright 1975, Biological Abstracts, Inc.
W76-06025

MACROVEGETATION AND ECOLOGICAL FACTORS IN TWO NORWEGIAN LAKES,
Oslo Univ. (Norway). Dept. of Limnology, and Oslo Univ. (Norway). Inst. of Marine Biology.
For primary bibliographic entry see Field 5C.
W76-06044

SEASONAL VARIATION IN DISSOLVED CARBOHYDRATE (DCHO) CONTENT IN THREE FRESHWATER PONDS,
Central Marine Fisheries Research Inst., Cochin (India).
S. Vijayaraghavan.
Indian J Fish. 20(1), p 157-165, 1973.

Descriptors: *Ponds, *Carbohydrates, Chlorophyll.
Identifiers: Dissolved carbohydrates, *India.

Seasonal variations in dissolved carbohydrate (DCHO) were studied in 3 tropical freshwater ponds for a period of 1 yr. In Othakadai Pond the DCHO values varied from 0.3-20.0 mg/1, the range of variation in Teppakulam Tank was from 1.6-28.1 mg/1 and in Yanamalai Pond it fluctuated from 0.3-27.5 mg/1. Fluctuations in DCHO content was related to chlorophyll a values only during a part of the annual cycle which indicates that plant organisms probably utilize the DCHO.--Copyright 1975, Biological Abstracts, Inc.
W76-06117

OBSERVATIONS ON THE SEASONAL FLUCTUATIONS OF PLANKTON IN THE CHILKA LAKE,
Central Inland Fisheries Research Inst., Cuttack (India). Fisheries Research Station.
S. Patnaik.
Indian J Fish. 20(1), p 43-55, 1973.

Descriptors: *Plankton, Phytoplankton, *Copepods, *Diatoms, Zooplankton.
Identifiers: *Chilka Lake(India), India.

An account is given of the main features of the plankton of Chilka Lake (India) from April, 1964-March, 1965. The seasonal fluctuations of the main constituent groups of phytoplankton and zooplankton in relation to some of the environmental variables are discussed. The diatoms and copepods formed the dominat groups in the plankton during the above period.--Copyright 1975, Biological Abstracts, Inc.
W76-06118

STUDIES ON THE CA, MG, AND SR CONTENT OF FRESHWATER CLAMSHELLS,
Texas Univ. at Dallas, Richardson.
G. F. Lee, and W. Wilson.
Trans Wis Acad Sci Arts Lett. 62, p 173-180, 1974.

Descriptors: *Clams, *Calcium, *Magnesium, *Strontium, *Wisconsin, Mollusks, Shellfish, Freshwater.
Identifiers: Lake Mendola(Wis), Lake Fox(Wis), Lake Trout(Wis), Shells.

The relationship of Ca, Mg and Sr in Lakes Mendota, Fox and Trout in Wisconsin and clamshells collected from these lakes shows a negative correlation between shell and water Sr/Ca ratio. The Mg/Ca ratio showed considerable scatter and in general a direct relationship between shell composition and water composition.--Copyright 1975, Biological Abstracts, Inc.
W76-06119

GENERIC COMPOSITION AND NUTRITIONAL REQUIREMENTS OF BACTERIA ISOLATED FROM THREE LAKES,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
W. Donderski, and E. Strzelczyk.
Acta Microbiol Pol Ser B Microbiol Appl. 6(2), p 67-74, 1974.

Descriptors: *Bacteria, *Benthos, *Lakes, Plankton, Amino acids, Nutrient requirements, Eutrophication, Vitamins, Growth rates.
Identifiers: Arthrobacter, Corynebacterium, Pleomorphism, Nocardia.

Studies were carried out on generic composition and nutritional requirements of planktonic and benthic bacteria isolated from 1 mesotrophic and 2 eutrophic lakes. The majority of benthic bacteria were identified as pleomorphic types (Arthrobacter-Corynebacterium group and the genus Norcardia). Also the genus Bacillus was quite common among the benthic isolates. Most of the benthic and planktonic bacteria required the presence of either amino acids or amino acids and vitamins for their best growth.--Copyright 1975, Biological Abstracts, Inc.
W76-06120

DIFFERENTIAL RESPONSES TO DROUGHT IN TWO SPECIES OF FUNDULUS,
Miami Univ., Coral Gables, Fla. Dept. of Biology.
J. A. Kushlan.
Copeia. 1973 (4), p 808-809, 1973.

Descriptors: *Drought tolerance, *Killifishes, *Florida, Fish behavior, Swamps, Fish reproduction, Drought resistance.
Identifiers: Fundulus-Chrysotus, Fundulus-Confluentus, *Big Cypress Swamps(Fla).

The golden topminnow (F. chrysotus) and the marsh killifish (F. confluentus) differed in their behavioral responses to lowering water levels in Big Cypress Swamp, Florida, during the spring drought of 1970. F. chrysotus became concentrated in the remaining pool of water while F. confluentus massed along its periphery. The distinct responses of the 2 spp. may relate to differences in reproductive strategy.--Copyright 1974, Biological Abstracts, Inc.
W76-06132

YEASTS ISOLATED FROM SOME LAKES AND RIVERS OF SASKATCHEWAN,
National Research Council of Canada, Saskatoon (Saskatchewan) Prairie Regional Lab.
For primary bibliographic entry see Field 5B.
W76-06135

SEASONAL DYNAMICS AND PRODUCTIVITY OF TANYTARSUS BARBITARSIS FREEMAN (DIPTERA:CHIRONOMIDAE) IN THE BENTHOS OF A SHALLOW, SALINE LAKE,
Mount Allison Univ., Sackville (New Brunswick). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-06142

DISTRIBUTION OF FISH IN INLAND SALINE WATERS IN VICTORIA, AUSTRALIA,
Monash Univ., Clayton (Australia). Dept. of Zoology.
B. C. Chessman, and W. D. Williams.
Aust J Mar Freshwater Res. 25(1), p 167-172, 1974.

Descriptors: *Australia, *Fish, *Distribution, *Saline lakes, Lakes, Salinity, Invertebrates.
Identifiers: Victoria.

The distribution of fish in Victorian saline lakes is discussed. Fourteen native and 5 exotic species are recorded from lakes of salinity greater than 3%, but no strictly inland species were found at salinities in excess of 31%. Reasons for the reduced penetration of fish into Victorian salt lakes compared with invertebrate penetration and fish penetration elsewhere are discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-06143

DYNAMICS OF BENTHIC INVERTEBRATES IN A TROPICAL MAN MADE LAKE (VOLTA LAKE 1964-1968): STANDING CROP AND BATHYMETRIC DISTRIBUTION,
Monash Univ., Clayton (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-06144

SEASONAL DISTRIBUTION O PHYTOPLANKTON IN KINJHAR (KALR LAKE,
Univ. Karachi, Karachi, Pak. Dep. Zool., Karac Univ. (Pakistan). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-06146

EURASIAN WATER-MILFOIL IN MICHIGAN,
Auckland Univ. (New Zealand). Dept. of Botany
For primary bibliographic entry see Field 5G.
W76-06149

2I. Water In Plants

SOME RELATIONS BETWEEN FORES LITTER AND GROWTH OF SITKA SPRUC ON POORLY DRAINED SOILS,
Queen's Univ., Belfast (Northern Ireland). De of Agricultural and Food Chemistry.
S. N. Adams.
J Appl Ecol. Vol 11 No 2 p 761-765. 1974.

Descriptors: *Organic matter, Litter, Forest soil
Identifiers: Picea Sitchensis, *Forest litter, Sit spruce.

Forest floor litter was sampled from 64 good a 55 bad plots of Sitka spruce (Picea sitchensis) gleyed soils in Northern Ireland. On 69 of the l sites, a peaty horizon overlaid the gleyed mine soil. The chemical analyses of the litters were lated to tree age and growth. As the trees beca older, the litter became more acid and some N w accumulated in it. Since these effects were rat small, there was little evidence that Sitka spru was causing serious site degradation. Gleys wit peaty horizon had a higher proportion of bad plo The pedological factors which cause orga matter accumulation and which give rise to pe gleys are also unfavorable to tree growth. Wh the effect of soil type was eliminated, litters un bad trees contained significantly less N than those under good trees. There was no signific difference in the content of any other nutrient. I suggested that the bad trees are N deficient. Co right 1975, Biological Abstracts, Inc.
W76-05687

RELATION OF THE CONSUMPTIVE U COEFFICIENT TO THE DESCRIPTION VEGETATION,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 2D.
W76-05843

RELATION OF WATER LEVEL AND FI AVAILABILITY TO WOOD STO REPRODUCTION IN THE SOUTHERN EVE GLADES, FLORIDA,
Geological Survey, Tallahassee, Fla.
J. A. Kushlan, J. C. Ogden, and A. L. Higer.
Open-file report 75-434, 1975. 56 p, 10 fig, 4 tab, ref.

Descriptors: *Environmental effects, *Ecolo *Wading birds, *Marshes, *Florida, Food chai Fish, Nesting, Birds, Hydrology, Balance of ture, Surface waters, Discharge(Water), Wa levels.
Identifiers: *Southern Everglades(Fla), *Wo storks.

The wood stork is a species of colonial wading b in the Florida Everglades that is most sensitive changes in the availability of food. Previous s dies have shown that the initiation and success wood stork nesting depends on high densities fish concentrated in ponds and other catchm basins during the dry season. The extreme dep dence of the wood stork on the cyclic hydrolo regime of the southern Florida wetlands make an indicator of the well-being and ecological

bility of the Everglades. The wood stork has declined in numbers over the last 25 years. One reason for the decline in the wood stork population was the change in the hydrologic regime of the Everglades which affected the feeding habitat and the food production. (Woodard-USGS)
W76-05850

FACTORS INFLUENCING INFILTRATION AND SEDIMENT PRODUCTION OF SEMIARID RANGELANDS IN NEVADA,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 2G.
W76-05912

IRRIGATING SEEDLING TEA IN SOUTHERN TANZANIA: EFFECTS ON TOTAL YIELDS, DISTRIBUTION OF YIELD AND WATER USE.
Tea Research Inst. of East Africa, Kericho (Kenya).
I. K. V. Carr.
J Agric Sci. Vol 83 No 2, p 363-378, 1974. Illus.

Descriptors: Crop production, Irrigation efficiency.
Identifiers: Tea seedlings, Tea yield, Tanzania.

In a dry area of Southern Tanzania with a single rainy season irrigation during the 6 mo. long dry season (May-Nov.) doubled the total amount yield of tea and at the same time evened its distribution over the yr to some extent. Other factors including low temperatures limited growth rates during the period June-Sept. despite irrigation, while a lull in production in Nov. appeared to be unrelated to external factors. Roots were traced to depths of about 4.3 and by the end of the dry season unirrigated bushes were drying the soil below 3 m. In general total yields decreased with decreasing frequency of irrigation and quantity of water applied but because these plants were deep rooting they could withstand deficits up to 100 mm without a reduction in yield, equivalent to a loss of about 25% of the total available water in the profile. There was some evidence that the most economical use of water occurred when the soil was not rewetted to field capacity at each irrigation, although yields were then less. Irrigation also reduced the incidence of a stem canker, Phomopsis theae. The implications of these results to the tea industry of East Africa are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-05928

WATER AND PHOSPHATE TRANSPORT TO PLANT ROOTS,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
E. Jakobsen.
Acta Agric Scand. 24(1): 55-60. 1974.

Descriptors: *Plant growth, *Root systems, *Water transfer, *Phosphates.

Solutions of the steady rate equation for water flow and phosphate diffusion to plant roots were derived. Evaluations of their validity in different cases and formulas for the calculation of time lag for these solutions are given. For water movement, soil resistance is usually small, whereas it constitutes the major resistance to phosphate transport. In soils with high adsorption capacity for phosphate and at low root density, the conditions for steady rate transport of phosphate are not reached in an acceptable time.--Copyright 1975, Biological Abstracts, Inc.
W76-06002

INDIGENOUS TREES OF THE HAWAIIAN ISLANDS,
H. Rock.
2nd Ed. 548p. Pacific Tropical Botanical Garden: Hawaii, Charles E. Tuttle Company: Rutland, Vt., Tokyo, Japan. 1974. $22.50.

Descriptors: *Hawaii, *Trees, Dicots, Ecology.
Identifiers: Clermontia, Coprosma, Cyanea, Euphorbia, Liliaceae, Metrosideros, Neowawraea-phyllanthoides, Palmae, Pandanaceae, Pittosporum, Platydesma, Santalum, Sideroxylon, Solanum, Straussia, Urera, Xanthoxylum.

This reprint edition of the 1913 publication describes and keys the indigenous trees (Pandanaceae, Liliaceae, Palmae and 39 dicot families) of the Hawaiian Islands. Descriptions of the botanical regions of the Hawaiian Islands are included. Keys to the species and genera are provided. The following new taxa (in 1913) are detailed: 2 new varieties and 1 new species in Pittosporum; 6 new varieties and 1 new species in Xanthoxylum; 4 new varieties and 5 new species in Pelea; Neowawreae phyllanthoides; 1 new species, 1 new variety and 1 new combination in Sideroxylon; 1 new species in Solanum; 2 new species and 3 new varieties in Straussia; 2 new species in Coprosma; 5 new species and 3 new varieties in Clermontia; 5 new varieties and 6 new species in Cyanea; and 1 new variety each in Urera, Santalum, Platydesma, Euphorbia and Metrosideros. Over 200 photographs illustrate the species' descriptions. Misidentified species and updating of the nomenclature are included in the addenda. Indices to the scientific and English and Hawaiian common names are provided.--Copyright 1975, Biological Abstracts, Inc.
W76-06005

BIOLOGY AND BIOENERGETICS OF GRASS CARP (CTENOPHARYNGODON IDELLA VAL.),
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
Z. Fischer, and V. P. Lyakhnovich.
Pol Arch Hydrobiol. 20(4): 521-557. 1973.

Descriptors: *Carp, Fish, *Fish reproduction, Europe, *Growth stages.
Identifiers: Ctenopharyngodon-Idella, *Grass carp, Amur River(USSR).

The grass carp-C. idella Val.-has become a very popular fish, being of considerable interest to both fish culturalists and biologists, mainly because of its ability to feed on various plants. Aquatic vegetation is usually poorly utilized and forms a serious obstacle to the efficient management of ponds and lakes. The grass carp is considered an effective remedy for this problem. In addition, the grass carp grows rapidly, and is large and tasty. These biological characteristics have prompted numerous attempts at acclimatization in freshwaters of Europe, Asia and North and South America. Animal food appears to play an important part both in the early and in the later stages of the grass carp's growth and development. The ecological peculiarities of grass carp reproduction under natural conditions, such as in the Amur River (USSR) flood plain, have produced serious difficulties in the grass carp's acclimatization. As a result, investigations have been made on the artificial reproduction and introduction of this species into new environments. Results of investigations of certain aspects of the biology of this fish are presented, which may elucidate the grass carp's role in the productive processes of aquatic ecosystems.--Copyright 1975, Biological Abstracts, Inc.
W76-06013

OVERWINTERING OF EVERGREENS IN PLASTIC STRUCTURES,
Michigan State Univ., East Lansing. Agricultural Experiment Station.
H. Davidson, and R. Mecklenburg.
Hortscience, Vol 9, No 5, p 479-480. 1974. Illus.

Descriptors: *Plastics, *Dehydration.
Identifiers: Desiccation, Evergreens, Overwintering.

The overwintering of evergreens without irrigation in plastic structures was best accomplished in a house oriented in a north-south direction and covered with milky polyethylene. Dehydration of evergreens in a structure covered with clear polyethylene and oriented in an east-west direction was attributed to high vapor pressure gradients that occurred in clear days. Evergreens overwintered in structures covered with clear polyethylene should be inspected periodically and irrigated as necessary to prevent desiccation.--Copyright 1975, Biological Abstracts, Inc.
W76-06014

EFFECT OF RUNNING WATER ON THE PREDATORY EFFICIENCY OF THE LARVIVOROUS FISH CAMBUSIA AFFINIS,
Bangalore Univ. (India). Dept. of Zoology.
S. Ravichandra Reddy, and T. J. Pandian.
Oecologia (Berl). 16(3): 253-256. 1974.

Descriptors: *Livebears, *Predation, Running waters.
Identifiers: Anopheles-stephansi, Culex-fatigans, Gambusia-affinis, *Larvivorous fish.

Effects of standing and running water on the predatory efficiency of the larvivorous fish Gambusia affinis was tested at 6 different current speed: 0.0, 0.8, 2.4, 4.5, 8.5 and 10.2 ml/sec. G. affinis preyed upon 25 Anopheles stephansi or 21 Culex fatigans (IV instar) during the test period of 10 h. The predatory efficiency of G. affinis decreased remarkably to about 60% and thereafter gradually to about 30% in aquaria containing running water at the speed of 2.4 and 10.2 ml/sec, respectively.--Copyright 1975, Biological Abstracts, Inc.
W76-06021

THE FAUNA OF CAREEL BAY WITH COMMENTS ON THE ECOLOGY OF MANGROVE AND SEA-GRASS COMMUNITIES,
Australian Museum, Sydney. Dept. of Marine Invertebrates.
For primary bibliographic entry see Field 2L.
W76-06022

SUBTIDAL MARINE BIOLOGY OF CALIFORNIA, WITH EMPHASIS ON THE SOUTH,
For primary bibliographic entry see Field 2L.
W76-06023

DETECTION AND PRELIMINARY IDENTIFICATION OF ENDOGENOUS ANTITRANSPIRANTS IN WATER-STRESSED SORGHUM PLANTS,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
A. B. Ogunkanmi, A. R. Wellburn, and T. A. Mansfield.
Planta (Berl). 117(4): 293-302. 1974.

Descriptors: *Antitranspirants, *Sorghum, Plant management, Stomata.
Identifiers: Commelina-Communis, Water stress(Plants).

S. (sudanense) plants that had been subjected to different degrees of water stress were examined for the occurrence of endogenous compounds capable of inducing stomatal closure, i.e. 'antitranspirants.' Acidic extracts contained increased amounts of abscisic acid (ABA) as the amount of stress increased, but another highly active compound easily distinguished from ABA also accumulated. This compound, also found in neutral extracts, was probably all trans-farnesol, an isoprenoid alcohol which, like ABA, is a sesquiterpenoid. Highly dilute solutions of 'commercial' farnesol induced stomatal closure when applied to isolated epidermis of Commelina (Communis).--Copyright 1975, Biological Abstracts, Inc.
W76-06026

IONIC LEAF ACCUMULATION IN GRAPES, GUAVA AND OLIVE PLANTS AS AFFECTED BY THE SALINITY OF IRRIGATION WATER,
Alexandria Univ. (Egypt). Faculty of Agriculture.
For primary bibliographic entry see Field 3C.
W76-06030

BREEDING PLACES AND SEASONAL INCIDENCE OF AEDES AEGYPTI, AS ASSESSED BY THE SINGLE-LARVA SURVEY METHOD,
World Health Organization, Dar es Salaam (Tanzania). East African Aedes Research Unit.
For primary bibliographic entry see Field 5G.
W76-06033

RESPONSE OF SOIL TESTACEA TO SOIL MOISTURE FLUCTUATIONS,
Calgary Univ. (Alberta). Dept. of Biology.
For primary bibliographic entry see Field 2G.
W76-06038

SELECTOR SYSTEMS IN RECORDING PHYSIOLOGICAL AND BEHAVIORAL ACTIVITY IN SEDENTARY AQUATIC ANIMALS,
Victoria Univ. of Manchester (England). Dept. of Zoology.
R. Earll, and D. T. Evans.
J Exp Mar Biol Ecol. 15(1): 35-41. 1974.

Descriptors: *Aquatic animals, *Animal physiology, Sessile algae, Invertebrates, *Animal behavior.
Identifiers: Aktograph, Bivalves, Recording, *Selector systems.

The design and use of selector systems in recording physiological rate functions and behavioral activity in sessile invertebrates, particularly bivalves, is described for use in the laboratory and the field. The experimental limitations of the technique are discussed and the use of switch systems with other types of aktograph is described. Switch systems permit large groups of animals to be used in activity studies while reducing both time spent in data handling and cost/animal of the recording system.--Copyright 1974, Biological Abstracts, Inc.
W76-06039

THE MICROENVIRONMENT OF CLIMACIUM AMERICANUM,
Platte Technical Community Coll., Columbus, Nebr.
For primary bibliographic entry see Field 2G.
W76-06045

FURTHER OBSERVATIONS ON THE MIGRATION OF GAMMARUS ZADDACHISEXTON (CRUSTACEA, AMPHIPODA) IN A FRENCH STREAM,
Amsterdam Univ. (Netherlands). Inst. of Taxonomic Zoology.
H. G. Dennert, and M. J. Van Marse.
Bull Zool Mus Univ Amst. 3(20): 157-167. 1974.

Descriptors: Crustaceans, Ions, Chlorides, Calcium, Physicochemical properties, Chlorine, Reproduction, Amphipoda, Streams, Mortality, *Migration, Streams.
Identifiers: *Gammarus-Zaddachi, *France.

The migration of G. zaddachi in La Slack, a small stream on the French Channel coast and some physico-chemical properties of the river are discussed. In laboratory experiments, the influence of the Cl-and Ca+ +concentration on the survival-rate and reproduction of G. zaddachi was investigated. A raise in the Cl-concentration of the medium caused a significant improvement of the survival rate. A rise in the Ca+ +concentration also gives, although not significant, a higher survival rate. --Copyright 1974, Biological Abstracts, Inc.
W76-06046

FOOD HABITS OF THE ROUGH SHINER, NOTROPIS BAILEYI SUTTKUS AND RANEY, IN HALAWAKEE CREEK, ALABAMA,
Ichthyological Associates, Inc., Drumore, Pa.
D. Mathur, and J. S. Ramsey.
Am Midl Nat. 92(1), p 84-93, 1974.

Descriptors: *Alabama, Diptera, *Shivers, *Fish food organisms, *Fish diets, Mayflies, Insects.
Identifiers: Halawakee Creek(Ala), Notropis-Baileyi, Trichoptera.

In Halawakee Creek Alabama, the rough shiner, N. baileyi, showed 2 distinct feeding peaks, one during the daylight and the other during the hours of darkness. Immature forms of Diptera, Ephemeroptera, and terrestrial insects were dominant in the diet during the 24-h period. These organisms were also common in the drift samples taken concurrently with the fish. Daily ration varied from 5.9-6.5% of the body weight. Feeding intensity was lowest in winter, highest in spring and summer and moderate in autumn. Fish less than 35 mm fork length fed on dipteran larvae, terrestrial insects and detritus throughout the year. The diet of the larger fish (>35 mm) was dominated by terrestrial insects, ephemeropteran nymphs, trichopteran larvae and detritus. The diet of the larger fish was more diverse than that of the smaller individuals. The opportunistic feeding habits are in part responsible for the success of this introduced species in Halawakee Creek.--Copyright 1974, Biological Abstracts, Inc.
W76-06126

NOTES ON THE PRODUCTION OF STREAM BRYOPHYTES IN THE HIGH PYRENEES (FRANCE),
Freshwater Biological Association, Wareham (England). River Lab.
F. H. Dawson.
Ann Limnol. 9(3), p 231-240, 1973.

Descriptors: *Productivity, Estimating, *Standing crops.
Identifiers: *Bryophytes, Cratoneuron-Commutatum, Fissidens, *Fontinalis-Squamosa, *France(Pyrenees region), Waterfalls.

A production estimate for Fontinalis squamosa of 92 gm m-2 is a minimum one, assuming an annual branching pattern. Standing crops for the total stream area of bryophytes of 325 gm m-2 for the site at Artigusse and of 92 gm m-2 for the Estaragne tributary were recorded. The area covered was high in the former and very low in the latter (only 7%). The maximum recorded standing crops were 1960 gm m-2 for Cratoneuron commutatum and 682 gm m-2 for Fontinalis and Fissidens combined. The splash zone around a small waterfall is described.--Copyright 1974, Biological Abstracts, Inc.
W76-06129

THE EFFECTS OF SIZE-SELECTION PREDATION AND ENVIRONMENTAL VARIATION ON THE DISTRIBUTION AND ABUNDANCE OF A CHIRONOMID, PARABORNIELLA TONNOIRI FREEMAN,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Entomology.
R. E. Jones.
Aust J Zool. 22(1), p 71-89, 1974.

Descriptors: *Predation, *Diptera, *Distribution, Australia, Breeding, Larvae, Vegetation, Ponds, Environmental effects.
Identifiers: Allotrissocladius-Sp, Paraborniella-Tonnoiri.

Larvae of the Australian chironomid P. tonnoiri live in temporary rainpools and aestivate in the dry mud during the summer drought. Over most of their range, they are restricted to large, deep, vegetated pools. A number of factors influence population numbers, but the most critical in deter mining the species' distribution is the presence o another chironomid, Allotrissocladius sp. Fourth instar Allotrissocladius larvae kill P. tonnoiri whe the latter are in 1st and possible 2nd instar. Th deep, vegetated pools have ample food availabl when P. tonnoiri breeds, so young larvae gro rapidly through their early in stars and soon ceas to be vulnerable. In shallower, non-vegetate pools, with much less food, the larvae grow mor slowly, are vulnerable for longer, and are con sequently eliminated. P. tonnoiri is also absen from areas where low temperatures during earl life may slow its growth and it seems likely that th same mechanism is responsible. It may seldom b enough to known about the gross structure an physical characteristics of an ecosystem in orde to predict whether or not a species will persist in i -it is also necessary to know some of the details o when and how it interacts with others.--Copyrigh 1974, Biological Abstracts, Inc.
W76-06130

PLANT DEVELOPMENT UNDER SNOW,
Wisconsin Univ., Madison. Dept. of Agronomy.
S. L. Kimball, and F. B. Salisbury.
Bot Gaz. 135(2) p 147-149, 1974.

Descriptors: *Snow cover, *Plant physiology *Growth rates, *Growth stages, Temperature.
Identifiers: Brodiaea-Douglassii, Claytonia-Lanceolata, Lithophragma-Glabra, Nemophila-Breviflora.

The growth and development of 5 montane species (Brodiaea douglassii, Claytonia lanceolata Lithophragma glabra, Nemophila breviflor Orogenia linearifolia) were observed under sno cover. Various stages of leaf, shoot and flow development occurred in the different speci while under snow cover and at temperatures near C.--Copyright 1974, Biological Abstracts, Inc.
W76-06147

2J. Erosion and Sedimentation

UNDERWATER WALL STRUCTURE,
For primary bibliographic entry see Field 8A.
W76-05523

TRACE ELEMENT, MINERALOGY, AND SIZ DISTRIBUTION OF SUSPENDED MATERIA SAMPLES FROM SELECTED RIVERS EASTERN KANSAS,
Kansas Univ., Lawrence. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-05606

RESERVOIR SEDIMENTATION ASSOCIATE WITH CATCHMENT ATTRIBUTES, LAN SLIDE POTENTIAL, GEOLOGIC FAULT AND SOIL CHARACTERISTICS,
Forest Service (USDA), Berkeley, Calif., Pacif Southwest Forest and Range Experiment Station
For primary bibliographic entry see Field 4D.
W76-05617

GUIDELINES FOR CHARACTERIZING NAT RALLY UNSTABLE OR POTENTIALLY U STABLE SLOPES ON WESTERN NATIONA FORESTS,
Forest Service (USDA), Corvallis, Oreg. Pacif Northwest Forest and Range Experiment Station
For primary bibliographic entry see Field 4D.
W76-05621

A STOCHASTIC MODEL OF DISPERSION O SEDIMENT PARTICLES RELEASED FROM CONTINUOUS SOURCE,
Montreal Univ. (Quebec). Dept. of Mathematics.
P. Todorovic.

Water Resources Research, Vol. 11, N.6, p 919-925, December 1975. 4 fig, 14 ref.

Descriptors: *Dispersion, *Stochastic processes, *Sediment transport, *Sediment discharge, *Sediment distribution, *Distribution patterns, Flow, Flow profiles, Sediments, Bed load, Suspended solids, Suspended load, Sediment load, Convection, Movement, Water pollution, Water pollution sources, *Path of pollutants, Mathematical studies, Statistical models.
Identifiers: *Random entry model.

The process of dispersion of bed sediment in streams has become a target for study because sediment may act as both a pollutant and a vehicle for soluble pollutants. Previous mathematical models of longitudinal dispersion of bed sediment described the behavior of a quantity of particles released simultaneously from a point or line source. The proposed model described the more common case of longitudinal dispersion of a quantity of sediment released gradually, at a known rate, during a specified time interval. Cases were examined for continuous release throughout finite and open-ended time intervals. Provided that certain regularity conditions hold, dispersion models may be obtained for both cases by simple integral transformation of the model for instantaneous release. (Bender - ISWS)
W76-05663

STABLE NUMERICAL MODEL FOR LOCAL SCOUR,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
M. A. Zaghloul, and J. A. McCorquodale.
Journal of Hydraulic Research, Vol. 13, No. 4, p 435-444, December 1975. 13 fig, 14 ref.

Descriptors: *Scour, *Erosion, Numerical analysis, Flumes, Turbulence, Turbulent flow, Hydraulics, Sediment transport, Open channel flow, Model studies, Velocity, Groins(Structures), Mathematical models.
Identifiers: *Local scour, Flume experiments, Scouring processes, Local velocity.

A numerical model for local scour was developed and confirmed by several flume experiments. The model involved two relaxation stages: (1) two dimensional relaxation in time, (2) relaxation of depth, i.e., the third dimension. The first stage solved the Helmholtz-Poisson form of the Reynolds equations with constant eddy viscosity and proceeded until a stable separation pattern was obtained. The second stage permitted the depth to change in such a way as to balance applied shear and the bed resistance. At this stage the vortex functions and vorticities are relaxed in space only. A stability analysis of the numerical model was completed. This model predicted both the depth and shape of the scour hole. The following conclusions were derived: (1) The proposed numerical model predicts both the depth and the size of the scour hole and is in good agreement with the experimental results. It was found that the velocity, local velocity, and turbulence are the main causes of erosion. (2) The alternating direction implicit scheme used with central time differencing has the advantage of averaging the error between successive time advancements and is proven to be stable for appropriate boundary conditions. (3) The finite difference formulation presented for the depth averaged stream function guarantees the stability of the solution. (Lee-ISWS)
W76-05666

DEVELOPMENT OF OXYGEN DEFICITS IN 14 SOUTHERN ONTARIO LAKES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-05679

FALLOUT CS-137: A TOOL IN CONSERVATION RESEARCH,
Agricultural Research Service, Oxford, Miss.
J. C. Ritchie, and J. R. McHenry.
Journal of Soil and Water Conservation, Vol. 30, No. 6, p 283-286, November-December 1975. 3 fig, 43 ref.

Descriptors: *Fallout, *Sedimentation rates, *Soil conservation, *Erosion control, *Sedimentation, Cesium, *Mississippi, Sediment transport, Silting, Erosion, Analytical techniques, Sediment discharge, Radioactivity, Water pollution sources, Radiochemical analysis, Water quality, Soil analysis, Reservoir silting, Topsoil, Soil erosion, Channels, Flood plains.
Identifiers: *Cesium-137, *Silting rates, Erosion cycle, Soil particles, Radioactive elements, Nuclear weapons, Radioactive tag.

Fallout from tests of nuclear weapons provides a unique tag for use in studies of the erosion cycle. Fallout cesium-137 (Cs-137) is tightly adsorbed on soil particles. Its movement within watersheds is predominantly associated with soil materials. These studies showed that the Cs-137 loss from watersheds correlates logarithmically with soil loss, as calculated by the universal soil loss equation and measured from small runoff plots. The distribution of Cs-137 in vertical profiles of sediment deposited in impoundments or floodplains can be correlated with yearly atmospheric fallout rates. It is therefore possible to estimate the sediment deposition rates from 1962 or 1958 to the present. This technique can be used to determine sedimentation rates in impoundments or floodplains for which other records are unavailable. (Henley - ISWS)
W76-05690

EQUATIONS FOR RESISTANCE TO FLOW AND SEDIMENT TRANSPORT IN ALLUVIAL CHANNELS,
Geological Survey, Reston, Va.
T. Maddock, Jr.
Water Resources Research, Vol 12, No 1, p 11-21, February 1976. 8 fig 4 tab, 35 ref.

Descriptors: *Equations, *Sediment transport, *Flow resistance, *Alluvial channels, Channel morphology, Flumes, Discharge(Water), Methodology, Evaluation.

(1) In a flume of constant width if discharges of water and sediment are introduced independently, mean velocity, mean depth, and slope dependent variables. (2) In a flume of constant width operated at constant depth and recirculating a mixture of water and sediment, the unit discharge of water and the depth are independent variables, while the sediment concentration, the slope, and the mean velocity are dependent variables. The two equations required for the solution of cases 1 and 2 are a resistance equation and a sediment transport equation. This paper presents these two relationships, to show that most previously proposed relationships contain within the formulation presented here, and to demonstrate that this formulation is superior to others in predicting the response of alluvial channel systems to changes in temperature. (Woodard-USGS)
W76-05844

LATE PLEISTOCENE AND HOLOCENE DEPOSITIONAL TRENDS, PROCESSES, AND HISTORY OF ASTORIA DEEP-SEA FAN, NORTHEAST PACIFIC,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W76-05845

SEDIMENT CHARACTERISTICS OF STREAMS IN THE EASTERN PIEDMONT AND WESTERN COASTAL PLAIN REGIONS OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
C. E. Simmons.
Available from Supt. of Documents, GPO, Wash., DC 20402, Price $1.40. Water-Supply Paper 1798-0, 1976. 32 p, 9 fig, 5 tab, 14 ref.

Descriptors: *Sediment transport, *Sediment yield, *Sediment distribution, *North Carolina, Streamflow, *Coastal plains, Slopes, Topography, Land use, Runoff, Storms, Reservoirs, Sediment discharge, Sedimentation rates, Data collections, Sampling, Suspended solids, Particle size.
Identifiers: *Piedmont region(NC).

The sediment-transport characteristics of streams were determined in a 6,000-square-mile area of the Coastal Plain and Piedmont regions of eastern North Carolina during 1969-73. The study covered all or parts of 21 counties and included data for 28 sediment-sampling stations located in parts of 4 major river basins, the Roanoke, Pamlico, Neuse, and Cape Fear. Annual suspended-sediment yields ranged from 333 to 12 tons per square mile. Streams in the Piedmont region have the highest yields. Suspended-sediment yield decreases in an eastward direction from the Piedmont to the Coastal Plain region. Sediment characteristics are directly affected by topography, storm runoff, geology, land use, and manmade detention structures. At one sampling station in the 1973 water year, 44 percent of the suspended sediment tonnage was transported during 34 days of high flow. In the Piedmont region, sediment yields vary indirectly with the percentage of forest cover in the basin, but there appears to be no definite relationship between forest cover and yield in the Coastal Plain region. Large lakes act as sediment-detention reservoirs. Average annual sediment yields ranged from 98 to 333 tons per square mile for 3 headwater streams which flow into Hyco Lake in Person County; however, the yield for the station less than 2 miles downstream from Hyco Dam was about 12 tons per square mile. Most suspended sediment during floods in Piedmont streams ranges in size from sand to silt, whereas the suspended material in flooding streams in the Coastal Plain is generally clay size. (Woodard-USGS)
W76-05849

SEDIMENT CHARACTERISTICS OF FIVE STREAMS NEAR HARRISBURG, PENNSYLVANIA, BEFORE HIGHWAY CONSTRUCTION,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4C.
W76-05854

THE 1973 MISSISSIPPI RIVER BASIN FLOOD: COMPILATION AND ANALYSES OF METEOROLOGIC, STREAMFLOW, AND SEDIMENT DATA,
National Weather Service, Silver Spring, Md.; and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-05860

ROLE OF COPEPOD FECAL PELLETS IN THE VERTICAL TRANSPORT OF FRESHWATER DIATOMS,
Argonne National Lab., Ill. Radioological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05880

VERTICAL TRANSPORT OF PARTICULATE MATERIAL IN LAKE MICHIGAN BY THE LORICA OF CODONELLA CRATERA,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05881

DISTRIBUTION OF DIATOM FRUSTULES IN LAKE MICHIGAN SEDIMENT CORES,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05882

DISTRIBUTION OF AMORPHOUS, DIATOM FRUSTULE, AND DISSOLVED SILICA IN A LEAD-210 DATED CORE FROM SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05883

STABLE LEAD GEOCHRONOLOGY OF FINE-GRAINED SEDIMENTS IN SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05884

GEOCHRONOLOGY OF LAKE MICHIGAN SEDIMENTS: ANOMALIES IN LEAD-210 DISTRIBUTIONS,
Michigan Univ., Ann Arbor
For primary bibliographic entry see Field 5B.
W76-05885

SEDIMENTARY PU-239, PU-240 PHASE DISTRIBUTIONS IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05891

THE DISTRIBUTION OF PLUTONIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05892

FACTORS INFLUENCING INFILTRATION AND SEDIMENT PRODUCTION OF SEMIARID RANGELANDS IN NEVADA,
Texas A and M Univ., College Station. Dept. of Range Science.
For primary bibliographic entry see Field 2G.
W76-05912

HYDRAULIC COMPUTATION OF A POOL HOLLOW,
For primary bibliographic entry see Field 2E.
W76-05931

SLOPE STABILITY PROBLEMS ASSOCIATED WITH TIMBER HARVESTING IN MOUNTAINOUS REGIONS OF THE WESTERN UNITED STATES,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-05944

INTERPRETING STABILITY PROBLEMS FOR THE LAND MANAGER,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-05947

THE FOREST ECOSYSTEM OF SOUTHEAST ALASKA 5. SOIL MASS MOVEMENT,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-05950

NEMATODES OF LAKE BALATON: IV. SEASONAL QUALITATIVE AND QUANTITATIVE CHANGES,
Research Inst. for Water Resources Development, Budapest (Hungary). Water Quality and Technology Dept.
For primary bibliographic entry see Field 5C.
W76-06004

MERCURY IN SEDIMENTS OF THE HORWER BUCHT (LAKE LUCERNE) AND TRIBUTARY STREAMS, SWITZERLAND,
Hobart and William Smith Coll., Geneva, N. Y. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-06136

MERCURY OCCURRENCE IN SEDIMENT CORES FROM WESTERN LAKE ERIE,
Bowling Green State Univ., Bowling Green, Ohio Dept. of Geology.
For primary bibliographic entry see Field 5B
W76-06137

APPLICATION OF INFRARED SPECTROSCOPY TO ERODIBILITY STUDIES OF THE SOIL,
Allahabad Univ. (India). Dept. of Chemistry.
S. Chandra, and S. K. De.
J Indian Chem Soc. 50(8), p 523-527, 1973

Descriptors: *Soil erosion, Spectroscopy, Infrared radiation, Analytical techniques, Arid lands, Asia.
Identifiers: *India(Uttar Pradesh).

The IR-absorption spectra of uneroded and eroded soils of semi-desert, arid, semi-arid, subhumid, Vindhyan and Bundelkhand soil-climatic regions of Uttar Pradesh, India, were taken by KBr-Mull technique on Perkin-Elmer IR spectrophotometer This technique was useful in characterizing eroded and uneroded soils and also in differentiating more erodible soils from erosion resistant ones.--Copyright 1974, Biological Abdtracts, Inc.
W76-06140

2K. Chemical Processes

AQUIFER EVALUATION USING DEPOSITIONAL SYSTEMS: AN EXAMPLE IN NORTH-CENTRAL TEXAS,
Dames and Moore, Boca Raton, Fla.
For primary bibliographic entry see Field 2F.
W76-05554

AUTOMATED DILUTION FOR MEASUREMENT OF NITRATE IN WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-05594

VERTICAL DISTRIBUTION OF NITRATE CONCENTRATION IN INTERSTITIAL WATER OF MARINE SEDIMENTS WITH NITRIFICATION AND DENITRIFICATION,
Brussels Univ. (Belgium). Industrial Chemistry Inst.
For primary bibliographic entry see Field 5B.
W76-05678

NATURE AND STABILITY OF COMPLEX MERCURY COMPOUNDS IN SURFACE AND GROUND WATERS, PHASE II,
Auburn Univ., Ala. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W76-05838

LIMNOLOGICAL DATA FOR THE MAJOR STREAMS IN CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-05852

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF EASTERN MONTANA, 1975-76,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W76-05853

HYDROGEOCHEMICAL DATA FROM INVESTIGATION OF WATER QUALITY IN SEWERED AND UNSEWERED AREAS SOUTHERN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 7C.
W76-05858

NUCLEAR TECHNIQUES IN HYDROLOGY CURRENT STATUS AND PROSPECTIVE USES
National Academy of Sciences, Washington D.C.; National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-05922

THE DEPOSITION OF MOLYBDENUM IN ANOXIC WATERS,
Scripps Inst. Oceanogr., La Jolla, Calif. Scripps Institution of Oceanography, La Jolla, Calif.
K. K. Bertine
Mar Chem. 1(1): 43-53. Illus. 1972.

Descriptors: *Molybdenum, Anaerobic conditions, Water chemistry, Chemical reactions, Sediment, Sulfate, Bacteria.
Identifiers: Anoxic.

Mo deposition in anaerobic areas is a result several processes. The primary one, wh removes about 70% of the Mo in laboratory periments, is the coprecipitation with iron sulf on a relatively short time scale (a week after hydrogen sulfide has built up). The formation Mo(V) by any of the following mechanis reduction by organic acids, reduction of Mo in N cycle or by sulfate-reducing bacteria, all re in a slow sorption or coprecipitation of about 2 of the total Mo after a 3-wk period onto almost a solid phase present. If the pH in the anoxic se ment decreases, this process becomes increasin important. The total removal of Mo at any sit the sum of these processes.--Copyright 19 Biological Abstracts, Inc.
W76-05996

MOLYBDENUM IN A NEARSHORE ESTUARINE ENVIRONMENT, NORTH WAL
Southampton Univ. (England). Dept. of Oceanography.
G. B. Jones.
Estuarine Coastal Mar Sci. 2(2): 185-189. 1974.

Descriptors: *Molybdenum, *Estuarine envir ment, Coasts, Sea water, Salinity, Sediment
Identifiers: Wales(UK).

Determinations of Mo were made on estuarine nearshore surface sea water and sediments lected off the North Wales coast (United K dom). The average ratio of concentration of (ug/l) to salinity (ppt) for the nearshore region in good agreement with other work on this elem for this region. Although dilution with fresh w was the major factor influencing the concentrat of Mo in the estuary, higher values of Mo in estuary, higher values of Mo were detected

me intermediate salinities. This increase in Mo ncentration could be due to desorption of par- ulate material during mixing. The relationship tween organic material, pH and the Mo content an anoxic sediment was studied on 2 cores ob- ned, at different seasons, from the same point a mud flat of the Menai Straits. The results ow a significant increase in Mo and organic terial for the core collected in Feb., compared that in Aug., and close correlation between their ncentrations. This type of environment could present an important temporary removal site for element.--Copyright 1975, Biological Abacts, Inc.
6-06000

TERMINATION OF SELENIUM IN NATUL WATERS USING THE CENTRIFUGAL OTOMETRIC ANALYZER,
nessee Univ., Knoxville. Dept. of Chemistry.
. Bowling, J. A. Dean, and G. Goldstein.
l Lett. 7(3), p 205-213, 1974.

criptors: *Analytical techniques, Water analy- *Ion exchange, Separation techniques, otometry, Pollutant identification, Centrifuga-

ntifiers: *Selenium.

apid ion exchange separation converts the hylene blue spot test for Se into a selective and itive method for quantitative determination of e quantities of Se. Increased speed, accuracy, reproducibility is achieved because of the llel analysis technique of the centrifugal ometric analyzer. Natural (stream and lake) r samples, spiked with 0.10-0.5 microgram of were analyzed with an average accuracy of after removal of interferences by ion ange.--Copyright 1974, Biological Abstracts,

-06128

Estuaries

OD PLAIN INFORMATION: COASTAL AS, LEVY COUNTY, FLORIDA.
y Engineer District, Jacksonville, Fla.
rimary bibliographic entry see Field 4A.
05647

TICAL DISTRIBUTION OF NITRATE CONTRATION IN INTERSTITIAL WATER OF INE SEDIMENTS WITH NITRIFICATION DENITRIFICATION,
els Univ. (Belgium). Industrial Chemistry

rimary bibliographic entry see Field 5B.
05678

ECTRAL LIGHT ABSORPTION METER MEASUREMENTS IN THE SEA,
nhagen Univ., Denmark. Inst. of Physical ography.
rimary bibliographic entry see Field 7B.
05680

PLEISTOCENE AND HOLOCENE SITIONAL TRENDS, PROCESSES, AND ORY OF ASTORIA DEEP-SEA FAN, HEAST PACIFIC,
gical Survey, Menlo Park, Calif.
son.
e Geology, Vol 20, No 2, p 129-173, Februa-. 12 fig, 5 tab, 109 ref.

ptors: *Sediment transport, *Columbia *Pacific Ocean, *Alluvial fan, *Oregon, nt discharge, Sediment distribution, Sedi- ion, Sediment yield, Turbidity currents, e size, Sedimentary petrology, Pleistocene

iers: *Holocene epoch.

Astoria Fan occupies approximately 20,000 sq km of the deep-sea floor off northern Oregon. The fan radiates asymmetrically southward from the mouth of Astoria Canyon which heads off the Columbia River. In the Late Pleistocene, turbidity currents funneled most coarse-grained debris through upper channels to depositional sites in middle and lower fan distributaries that periodically shifted, anastomosed and braided to spread sand layers throughout the area. At this time, depositional rates were many times greater (50 cm/1000 years) than in the Holocene (8 cm/1000 years). By the Late Holocene, continuous particle-by-particle deposition of hemipelagic clay with a biogenous coarse fraction was the predominant process on the fan. These hemipelagites contain progressively more clay size and less terrigenous debris offshore, and are finer grained, richer in planktonic tests and dominated by radiolarians compared to the foraminiferal-rich Pleistocene clays. The hemipelagic sedimentation of interglacial times, however, is insignificant compared to turbidite deposition of glacial times. (Woodard-USGS)
W76-05845

SEDIMENT CHARACTERISTICS OF STREAMS IN THE EASTERN PIEDMONT AND WESTERN COASTAL PLAIN REGIONS OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 2J.
W76-05849

CONDITIONAL EXPECTED TSUNAMI INUNDATION FOR HAWAII,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 8B.
W76-05920

ESTIMATE OF THE RATE OF TURBULENT MIXING OF THE FLUID IN WIND-DRIVEN CURRENTS FROM THE RESULTS OF MOVING AND STILL PARTICLE PHOTOGRAPHY,
For primary bibliographic entry see Field 8B.
W76-05932

MIREX RESIDUES IN SELECTED ESTUARIES OF SOUTH CAROLINA: JUNE 1972,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W76-05954

THE DEPOSITION OF MOLYBDENUM IN ANOXIC WATERS,
Scripps Inst. Oceanogr., La Jolla, Calif. Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2K.
W76-05996

MOLYBDENUM IN A NEARSHORE AND ESTUARINE ENVIRONMENT, NORTH WALES.
Southampton Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 2K.
W76-06000

DISTRIBUTION AND STRUCTURE OF BENTHIC ASSEMBLAGES IN PUGET SOUND, WASHINGTON, USA,
United Nations Educational, Scientific, and Cultural Organization, Paris (France).
For primary bibliographic entry see Field 5B.
W76-06015

CHANGES IN THE LIMNOLOGICAL FEATURES OF A MEROMICTIC LAKE SUIGETSU DURING THE YEARS, 1926-1967,
Nagoya Univ. (Japan). Water Research Lab.
For primary bibliographic entry see Field 2H.
W76-06018

THE FAUNA OF CAREEL BAY WITH COMMENTS ON THE ECOLOGY OF MANGROVE AND SEA-GRASS COMMUNITIES,
Australian Museum, Sydney. Dept. of Marine Invertebrates.
P. A. Hutchings, and H. F. Recher.
Aust Zool. 18(2): 99-128. 1974.

Descriptors: *Australia, Bays, Detritus, Ecology, Salt marshes, *Mangrove swamps.
Identifiers: *Careel Bay(Australia), Posidonia, *Sea-grass, Zostera.

Careel Bay, Pittwater, New South Wales can be divided into 5 zones, salt marsh, mangroves, Zostera and Posidonia weed beds and sandy beach. The flora and fauna of each of these zones are described with comments on the seasonal abundance of animals in the weed beds and on the sandy beach. Finally the inter-relationship of these zones to each other, especially in relation to the detritus food chain, is discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-06022

SUBTIDAL MARINE BIOLOGY OF CALIFORNIA, WITH EMPHASIS ON THE SOUTH,
R. Galbraith, and T. Boehler.
Naturegraph Publishers; Healdsburg, Calif., 1974. 128 p, $3.95.

Descriptors: *California, *Marine biology, Tidal waters, Publications, Marine fish, Marine plants, Marine animals, Plankton.

Marine plants and animals located in the near shore waters of California and around the offshore islands of California are described in this book which is intended as a guide and reference for students of marine life and divers. The book is also designed to serve as a bridge between the student-divers observations and technical publications on marine biology. The characteristics of sharks and rays are discussed. Practical information is given for divers encountering a shark. Species of bony fishes are identified and described and keys to their identification are included. Representative forms of invertebrate groups are also detailed. Species of marine, plankton, plants and mammals are described. The study of marine ecology, fish and game regulations, preservation of the marine environment, oil, thermal and waste pollution in the marine environment and pesticide concentrations were discussed. A bibliography and index are provided. Numerous line drawings and photographs illustrate the text.--Copyright 1975, Biological Abstracts, Inc.
W76-06023

TRACE METALS IN THE WATERS OF THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W76-06024

EPIZOOTIOLOGY OF MINCHINIA NELSONI IN SUSCEPTIBLE WILD OYSTERS IN VIRGINIA, 1959 TO 1971,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W76-06035

SPATIAL DISPERSION OF AN ESTUARINE BENTHIC FAUNAL COMMUNITY,
Swedish Water and Air Pollution Research Lab., Goteborg.
R. Rosenberg.
J Exp Mar Biol Ecol. 15(1): 69-80. 1974.

Descriptors: *Benth fauna, *Dispersion, *Spatial distribution, Sediments, Estuarine environment.

By means of a box-sampler 20 moderately undisturbed sediment samples were obtained, which were subsampled on board the ship. The fauna in the upper 0-5 cm of the sediments was compared to that in the 5-10 cm layer; almost all species collected in both strata were found in the upper 0-5 cm. About 64% of the individuals and 74% of the biomass were restricted to this upper layer. A sample area of 0.5 m2 (depth 0-10 cm) was sufficient to make a quantitative evaluation of the benthic community. The horizontal dispersion of the macrobenthic community was studied using the variance/mean ratio and its dependence on sample size is discussed. The abundant species occurred in patches large than 0.06 m2 and high densities were correlated with aggregation.--Copyright 1974, Biological Abstracts, Inc.
W76-06040

FOOD OF TARAKIHI IN WESTERN BAY OF PLENTY AND TASMAN BAY, NEW ZEALAND,
Public Service Electric and Gas Co., Newark, N. J. Research and Development Dept.
B. L. Godfriaux.
N Z J Mar Freshwater Res. 8(1): 111-153. 1974.

Descriptors: Bays, Crustaceans, Mollusks, Polychaetes, Teleosts, Aquatic animals, Fish food organisms.
Identifiers: *Cheilodactylus-Macropterus, Echinoderm, *New Zealand, *Tarakihi, Western Bay of Plenty(NZ), Tasman Bay(NZ).

Feeding was examined in 1574 tarakihi, Cheilodactylus macropterus (Bloch and Schneider) (Teleostei: Cheilodactylidae). Occurrence, points (bulk and numbers methods of gut content analysis were used throughout the study. By all three methods of analysis, polychaetes, crustaceans, echinoderms and mollusks (in that order) generally formed the main food groups. Crustaceans dominated the food of tarakihi (15 cm in fork length, and polychaetes were the dominant food group in specimens) 15 cm. Length of specimen, sampling depth and area, geographical region and time of day affected the occurrence, volume and numbers of food items in the gut, but sex and season did not. Male tarakihi frequented deeper water than females; this result was significant at the (0.001 level.--Copyright 1974, Biological Abstracts, Inc.
W76-06047

THE WASHINGTON SHORELINE MANAGEMENT ACT,
For primary bibliographic entry see Field 5G.
W76-06056

COASTAL ZONE MANAGEMENT AND INTERGOVERNMENTAL COORDINATION,
Louisiana State Univ., Baton Rouge. Law School.
For primary bibliographic entry see Field 6E.
W76-06057

COASTAL ZONE MANAGEMENT PROGRAM DEVELOPMENT GRANT.
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-06095

MICROORGANISMS AND SULPHIDE IN A POLLUTED ESTUARY,
Canterbury Univ., Christchurch (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-06121

THE ECOLOGY OF MORRUMBENE ESTUARY, MOZAMBIQUE,
Cape Town Univ. (South Africa).
J. H. Day.
Trans R Soc S Afr. 41(1), p 43-97, 1974.

Descriptors: Ecology, Estuaries, Africa, Estuarine environment, Mangrove swamps, Invertebrates, Fish, Productivity, Seasonal, Crabs.
Identifiers: *Morrumbene estuary(Mozambique).

Morrumbene is a tropical estuary which opens into Inhambane Bay at 23S on the coast of Mozambique. It is 193 km2 in area and 20 km long with well-developed mangrove swamps draining into a broad lagoon. Temperature, Salinity and substrate conditions are described and it is shown that water temperatures in the upper reaches vary from 18.8C in winter to 28.2C in summer. The vegetation is described briefly. The fauna was sampled by dredging, netting and intertidal transects along the estuary. It is very diverse. An annotated list shows the distribution of 404 macroinvertebrates and 114 spp. of fish. The estuary is not highly productive. The bulk of the fauna is confined to the lagoon and the mangrove swamps in the upper reaches have a restricted and monotonous fauna. All shores are dominated by crabs. Vertical distribution on the shore is controlled by many factors and the depth of the water-table and shade appear to be more important than tidal level. The fauna includes 70% tropical species, 13% subtropical endemics and 6% Cape endemics. The estuarine fauna of Morrumbene has only 15% similarity to the fauna of an exposed seashore nearby, but 60% similarity to the fauna of the sheltered seashores of Inhaca Island 400 km to the south. The Morrumbene fauna is much richer in species than all the estuaries in Natal or the southern Cape; it is 6 times richer than all the estuaries on the cold Atlantic coast. At the mouths of Atlantic coast estuaries there is a marked temperature barrier in summer and it is suggested that this may limit the estuarine fauna.--Copyright 1974, Biological Abstracts, Inc.
W76-06127

EFFECTS OF A TROPICAL CYCLONE ON LITTORAL AND SUB-LITTORAL BIOTIC COMMUNITIES AND ON A POPULATION OF DUGONGS (DUGONG DUGON (MULLER)),
James Cook Univ., of North Queensland, Townsville (Australia).
G. E. Heinsohn, and A. V. Spain.
Biol Conserv. 6(2), p 143-152, 1974.

Descriptors: *Australia, *Littoral, *Cyclones, *Mangrove swamps, Algae, Biota, Biological communities, Phaeophyta, Aquatic animals.
Identifiers: Dugong-Dugon, *Dugongs, *Mangroves, Queensland, Seagrass, *Tropical cyclones.

The extensive damage to littoral and sub-littoral biotic communities caused by cyclone 'Althea', which crossed the tropical coast of Queensland (Australia) on 24 Dec. 1971, are described. The effects of high wind speeds (mean 129.7 km/h), turbulent seas, storm surges and heavy rainfall on mangrove, sea grass, algal and coral reef communities are discussed. Mangroves withstood the immediate effects of the cyclone and protected coastal areas. However, long-term effects on mangroves are apparent. Severe wave action, shifting sand, and low salinities caused extensive damage to sea grass, algal and coral reef communities. The effects of the cyclone on a dugong population are described. The catches of dugongs in shark nets set off Townsville increased from an average of 12.7/yr before the cyclone to 41 in 1972 (the yr following the cyclone). This increase is attributed to increased movements in search of food, following extensive damage to sea grass beds. Associated with increased movements, a change in diet occurred whereby large amounts of brown algae were eaten in addition to sea grasses. Sex and size (age) distributions of captured dugongs are given and their possible significance discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-06131

DIFFERENTIAL RESPONSES TO DROUGHT IN TWO SPECIES OF FUNDULUS,
Miami Univ., Coral Gables, Fla. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W76-06132

NOTES ON THE BIOLOGY OF SOM ESTUARINE BIVALVES,
Port Elizabeth Univ. (South Africa). Dept. Zoology.
A. McLachlan.
Zool Afr. 9(1), p 15-34, 1974.

Descriptors: Africa, Estuaries, *Estuarine e vironment, *Growth rates, Seasona Aging(Biological), Biological communities.
Identifiers: *Bivalves, Dosinia-Hepatica, Euma cia-Paupercula, Macoma-Litoralis, Psammote lina-Capensis, Solen-Capensis, Solen-Corneu *Swartkops estuary(South Africa).

Studies on bivalves (Dosinia hepatica, Macoma toralis, Solen corneus, S. capensis, Psammotelli capensis, Eumarcia paupercula in the Swartko estuary (South Africa) have indicated that spatf occurs during late summer. After adult popul tions had been decimated by floods in 1971 sp made up a large proportion of the bivalve popu tion in 1973. Growth rates vary at different int tidal levels and in different parts of the estuary a growth varies seasonally. In 2 spp. age determir tions from growth rings corresponded well w age determinations from size frequency hist grams.--Copyright 1974, Biological Abstracts, In
W76-06134

THE COMBINED EFFECTS OF HIGH SALI TY AND TEMPERATURE ON THE SURVIV OF YOUNG LIMANDA LIMANDA,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W76-06148

EVALUATION OF SURFACE WATER POLL TION AT SEVERAL POINTS IN RELATION ZONES OF SHELLFISH INDUSTRY IN ROA STEADS OF THE BREST REGION, FRENCH),
For primary bibliographic entry see Field 5B.
W76-06150

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

BUFFERED, WEAK ION-EXCHANGE WAT DEMINERALIZATION PROCESS,
Aerojet-General Corp., El Monte, Ca (Assignee).
A. Katzakian, Jr., and D. O. Depree.
U.S. Patent No. 3,928,192, 9 p, 2 fig, 3 tab, 4 r Official Gazette of the United States Patent fice, Vol 941, No 4, p 1781-1782, December 1975.

Descriptors: *Patents, Water treatme *Demineralization, Water quality cont *Desalination, Water purification, *Ion exchan Anion exchange, Cation exchange, Indust wastes, Tertiary treatment, Brackish wa *Waste water treatment.

The process of this invention allows the effici use of weak 'acid' cation and weak 'base' an exchange resins in a separated, fixed-bed or m ing bed, both current and countercurrent confi rations for the purpose of removing 'solu water soluble salts dissolved in brackish and w water streams. The process comprises the step passing the feed stock through a weak cation r buffered with a suitable weak base, such as, an ganic amine and exchanging the cations of the f for the buffer cation. The released buffer ca

d the anions of the feed water minerals and ion exchange resin combine to remove the ions, releasing hydroxyl ion to form buffer droxide (i.e., the buffer in its free base form). e released buffer is then deposited on a further d of weak cation exchange resin which when ded is used as the first bed of the next nineralization cycle while the first bed is enerated. The resin columns may be provided lternating pairs (head-tail sequence) of two ca- n resin columns in series with at least one anion in column in further series with one or two ca- n resin columns. The system will cleanse source er in unlimited quantity and will eliminate brine posal if used in conjunction with specialized eneration techniques now available. (Sinha-IS)
6-05526

IBITION OF SCALE DEPOSITION,
gon Corp., Pittsburgh, Pa. (Assignee).
primary bibliographic entry see Field 5D.
5-05529

ECTION DEVICES FOR USE IN SOLUTION CESSING SYSTEMS,
er Purification Associates, Cambridge, Mass. ignee).
primary bibliographic entry see Field 5F.
-05532

NOMIC MAGNITUDES AND ECONOMIC ERNATIVES IN LOWER BASIN USE OF ORADO RIVER WATER,
ona Univ., Tucson. Dept. of Agricultural omics.
. Martin.
ral Resources Journal, Vol. 15, No. 1, p. 229-975. 3 tab., 13 ref.

riptors: *Colorado River, *Desalination s, *Alternate planning, *Cost-benefit analy- nited States, Mexico, Treaties, Arizona, Ir- on districts, Return flow, Water conserva- Irrigation practices, Sprinkler irrigation, An- osts, Irrigation water, Flood irrigation.

natives are proposed to a $115 million project lude a water desalting plant to reduce the y of water delivered to Mexico from the r Colorado River as irrigation drainage flow. Much of the salinity concentration is ted by about 27,000 acres of cropland, using 336,000 acre-feet of water on the mesa County, Arizona. The mesa specializes in production where net returns may reach $400 per acre. To overcome the farmers' nce to investment in substituting sprinkler cle irrigation for the present flood irrigation in order to reduce the return flows, several ves are proposed. The reduced revenues to mers' cooperative irrigation district because water sold could be compensated through e of electrical energy to run the sprinklers, would generate a saving of $9.00 per acre. r alternative would be to pay the farmers r acre per year for the next 50 years. It is ed that the annual cost of desalting the ater from these farms could buy out the hemselves in from 2 to 9 years. The yearly desalting the drain water would equal the e cost of investment in sprinkler or trickle n systems in 2 to 3 years. (Auen-Wiscon-
311

NATION APPARATUS,
t Co. Ltd., Osaka (Japan). (Assignee).
ichi.
ent No. 3,930,958, 4 p, 6 fig, 4 ref; Official of the United States Patent Office, Vol , p 414, January 6, 1976.

Descriptors: *Patents, *Desalination, *Water treatment, Water purification, Sea water, *Evaporation, *Condensation, *Desalination apparatus, Separation techniques, Heat pumps, Thermal properties.
Identifiers: Solar energy.

The invention provides a multi-effect desalination apparatus (performing both evaporation and condensation of salt water), wherein the effective utilization of thermal differences is achieved by leading the sea water between the fixed thermal difference and making use of the calorie of vapor for double purpose and effect. The apparatus comprises, in combination, at least three evaporating-condensing elements coaxially superposed in a vertical structure, with circumscribing rims and inward declining bottom diaphragms. A feed tube above the topmost one of the elements introduces salt water. The diaphragms have upward diverging inner walls defining central ducts which constitute an axial passageway through the structure. Liquid-conveying discharge pipes lead from each of the elements to the next lower element, except for the lowermost one which has instead a tube for discharging concentrated salt water. There are means for heating the lowermost element, a drain receiver below the lowermost one of the ducts for leading away condensed vapors, and condensation-promoting, drop-inhibiting layers applied to the undersides of at least some of the diaphragms. The layers may be in the form of a metallic mesh. Although not within the framework of the invention, solar energy can be used effectively as a heat source and a heat pump can be used as an assistant heat source. (Sinha-OEIS)
W76-05959

METHOD OF PREVENTING SCALE FROM BEING DEPOSITED IN CASE OF PRODUCING FRESH WATER FROM SEA WATER,
Industrial Science and Technology, Tokyo (Japan). (Assignee).
K. Hirota, Y. Takata, Y. Arikawa, K. Tanno, and Y. Okajima.
U.S. Patent No. 3,932,273, 5 p, 1 fig, 1 tab, 3 reg; Official Gazette of the United States Patent Office, Vol 942, No 2, p 869, January 13, 1976.

Descriptors: *Patents, *Desalination, *Sea water, *Water treatment, *Water purification, *Scaling, *Desalination processes, Flash distillation, Vapor compression distillation, Chemical reactions.

A method is disclosed for preventing scale from being deposited on the heat transfer surface of apparatus for producing fresh water from sea water. A method of preventing alkaline scale in a vapor pressure type evaporator and a multiple flash evaporator comprises adding to the sea water a small amount of a seed crystal selected from the group consisting of calcium carbonate and magnesium hydroxide and at least one surface active agent selected from the group consisting of nonionic surface active agent and cation surface active agent. The temperature of the sea water is controlled to about 120 deg C or lower so as to prevent deposition of hard scale. The surface agent exhibiting no flocculation effect for the scale crystal making the scale component grown on the seed crystal is effective to prevent the scale from being deposited. The surface active agents have their single molecule adhered to fine rains of the scale component, and as a result, can mitigate the electric charge of the scale component, whereby the scale component is easily grown on the seed crystal. The surface active agent having this effect is a cation surface active agent which is quaternary ammonium salt and a nonionic surface active agent such as polyoxyethylene alkylamine that contains in its molecule a nitrogen atom having a weak positive electric charge. (Sinha-OEIS)
W76-05971

MULTISTAGE FLASH EVAPORATOR FOR PRODUCING SOFT WATER FROM A SALINE WATER,
Societa Italiana Resine S.p.A., Milan (Italy). (Assignee).
D. Barba, A. Germana, G. Liuzzo, G. Tagliaferri, and G. Spizzichino.
U.S. Patent No. 3,933,597, 5 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1334, January 20, 1976.

Descriptors: *Patents, *Desalination, *Demineralization, *Saline water, *Water softening, *Water purification, Water quality control, Flash distillation, Condensation, Evaporation, Desalination apparatus, Separation techniques.

A multistage flash-evaporator for producing soft water from a saline water comprises: a horizontal, uninterrupted rectilinear tubular shell having a pair of transverse end walls; a number of longitudinally spaced transverse partition walls in the shell subdividing the inside into a series of consecutive distilling units; and a longitudinally extending hood in each unit subdividing the inside of the unit into an evaporation chamber and a condensation chamber. The longitudinally extending hood includes a filtering zone pervious to steam through which the evaporation chamber is connected with its associated condensation chamber in the unit. Normally submerged passages in each partition wall allows a continuous flow of saline water through the evaporation chambers in the consecutive units; and a condensor in each unit comprises a rectilinear bundle of heat exchange tubes extending longitudinally in the condensation chamber. The crude saline water is continuously supplied to the condenser in one end unit of the evaporator to provide a coolant flowing in the condenser tubes throughout the whole length of the evaporator. The crude saline water discharged from the condenser in the opposite end unit is then heated to a suitable temperature and is delivered to the evaporating chamber from which it flows through all the units. The units operate at absolute values decreasing in the direction of flow of the saline water and the steam flashing out from the saline water in each unit is condensed on the tubes of the condenser and is collected. (Sinha-OEIS)
W76-05978

METHOD AND APPARATUS FOR DESALINIZATION OF WATER,
A. Y. Dodge.
U.S. Patent No. 3,933,600, 5 p, 4 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1335, January 20, 1976.

Descriptors: *Patents, *Desalination, *Saline water, *Water purification, *Desalination apparatus, *Water vapor, Evaporation, Distillation, Scaling, Desalination wastes, Separation techniques, Potable water.

A primary object of this invention is to vaporize salt-free water from a body of salt-containing water in a manner to reduce the tendency for scale to deposit on surfaces which are in contact with the salt-containing water. Water containing dissolved salt is introduced into a closed vessel and is partially vaporized by direct contact of the water with a flame. As much as one-half to three-fourths of the water is transformed into vapor and a residue of unvaporized water of correspondingly increased salt content, e.g., three times as much salt as the initial water, is collected at the bottom of the vessel for continuous or intermittent discharge. A gaseous mixture of vaporized water and combustion products is drawn off from the top of the vessel and passed through a condenser in which the water vapor is condensed. A second feature is practiced in combination with the closed vessel in which a branch stream of the feed water is heated to moderately low temperature and is injected by spraying into the upper part of a second vessel which is also closed and is operated at a reduced pressure, sufficiently low to cause partial

vaporization of the injected water to a desired extent. The unvaporized residue, enriched in salt, is collected in the lower part of the second vessel. A low pressure is maintained within the second vessel by reducing the pressure of the water vapor discharged from the top, as well as the pressure of the residual water within the vessel, which is discharged from the bottom. (Sinha-OEIS)
W76-05979

DESALINATION PROCESS BY IMPROVED MULTISTAGE ELECTRODIALYSIS,
Ashi Kasei Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
L. Ehara, T. Miwa, and M. Kamaya.
U.S. Patent No. 3,933,610, 10 p, 7 fig, 8 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1338, January 20, 1976.

Descriptors: *Patents, *Desalination, *Demineralization, *Scaling, *Membrane processes, *Permselective membranes, Water treatment, Water quality control, *Electrodialysis, Anions, Cations, Electrochemistry.

An electrodialysis process for the desalination of aqueous salt solutions has two or more stages for electrodialysis which are connected in series to effect dilution by reduction of total ion content in progressive stages. Each stage has multiple pairs of anionic and cationic membranes alternately placed to divide the stage into alternate dilution and concentration chambers containing dilution and concentration streams. The salt solution contains at leastone divalent anion and at least one divalent cation capable of forming an insoluble salt in the concentration stream. At least one of the divalent cations or anions are selectively retained in the dilution stream by conducting electrolysis through an anion exchange membrane which forms a boundary of the dilution chamber and has a divalent ion permselectively coefficient which is sufficiently less than one. The concentration ratio of the selectively retained divalent cation or anion to monovalent ion of the same charge in the dilution chamber is increased and the concentration product of divalent cations and anions which are capable of forming the insoluble salt in the concentration chamber does not exceed the solubility product of the insoluble salt. (Sinha-OEIS)
W76-05980

METHOD OF OPERATING ION EXCHANGE SYSTEM,
Permutit Co., Paramus, N.J. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05983

REVERSE OSMOSIS SEPARATION APPARATUS,
Toray Industries, Inc., Tokyo (Japan). (Assignee).
N. Kanamaru, and H. Fujino.
U.S. Patent No. 3,933,646, 6 p, 10 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1350, January 20, 1976.

Descriptors: *Patents, *Reverse osmosis, *Membrane processes, *Membranes, *Water treatment, *Waste water treatment, *Desalination processes, Laminar flow, Water quality control, Separation techniques.
Identifiers: Spiral passages.

A reverse osmosis separation apparatus comprises a cylindrical chamber and a membrane module with its axiscoaxial to the chamber. The module is comprised of a hollow mandrel having a hole or axially aligned holes on its outer circumference and a pair of membrane sheet spaced apart from each other by spacing layers and spirally wound about the mandrel to form a first spiral passage for a permeated solution between the opposite inner surfaces of the sheets and to form a second spiral passage for a feed solution between the opposite outer surfaces of the sheets. The first passage is closed at the outer edges of the entire lengths of the sheets and has an outlet connected with the interior of the mandrel. The second passage has an inlet and an axial outlet opening at the spiral edges of the sheets in the vicinity of the mandrel. The first and second passages are closed at the opposite spiral edges of the sheets except for the partial length where the axial outlet opening is formed. Means are provided for supplying the feed solution into the chamber to allow it to flow into the second passage from the inlet opening in a direction perpendicular to the axis; means for discharging the nonpermeated solution having flowed out through the axial outlet opening of the second passage from the chamber and mean for discharging the permeated solution having flowed into the interior of the mandrel. The feed solution passes spirally through the second passage while a solution having a concentrated solvent permeates from the feed solution by reverse osmosis. (Sinha - OEIS)
W76-05990

APPARATUS FOR THE SEPARATION OF LIQUID MIXTURES MY MEANS OF PERMEABILITY SELECTIVE SEPARATION MEMBRANES,
Louis Schleiffer A. G., Feldbach (Switzerland). (Assignee).
F. Muller.
U.S. Patent No. 3,933,647, 5 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1350, January 20, 1976.

Descriptors: *Patents, *Membrane processes, *Separation techniques, *Permselective membranes, *Waste water treatment, *Water treatment, *Desalination apparatus, Water quality control, Water pollution control.
Identifiers: Perstraction, Pervaporation.

An apparatus for the separation of liquid mixtures by means of permselective separation membranes comprises at least one separation module incorporating a distributor plate, a collector plate and an intermediately situated separation membrane. The separation module can be operated with different types of separation membranes both under high pressure as well as under high vacuum. The distributor plate at the region of the effective membrane surface has at least one throughflow opening arranged at the periphery for the mixture to be separated-out as well as one open flow channel extending along a curved line from this opening to the center of the membrane. The flow channel is arranged such that the mixture is exposed along one side of the membrane to a turbulent flow for the successive flushing of the membrane surface along a serpentine-shaped or undulated path from the periphery to the center. The membrane possesses an axial throughflow opening into which opens the flow channel. The collector plate has an axial bore, a substantially ring-shaped recess opposite the flow channel, and a highly porous carrier element arranged in the ring-shaped recess for uniformly supporting the membrane at its exit or discharge side as well as at least one collecting channel leading from the periphery of the ring-shaped recess towards the outside. The carrier element is constructed to be pressure resistant and highly porous in such a way that it can permit a rapid unhindered flowing-off of the material which flows through and out of the membrane via the recess to the collecting channel without any considerable pressure drop and at the same time opposing any bending-through of the membrane. (Sinha - OEIS)
W76-05991

OPERATION OF PILOT PLANT LTV EVAPORATOR AT WRIGHTSVILLE BEACH, NORTH CAROLINA.
Badger (W. L.) Associates, Inc., Ann Arbor, Mich.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-161 290 as 5.00 in paper back, $2.25 in microfiche. -- OSW/RDPR/26, December 1959. 103 p., 59 fig, tab, 6 ref. DoI 14-01-001-93

Descriptors: *Desalination, *Distillation, *He transfer, *Evaporators, *Long-Tube Vertic Distillation, Corrosion, Scaling, Constructi materials, North Carolina, Pilot plants.
Identifiers: Rising film, Falling film, Forced circ lation.

A pilot plant was bulit as a single effect Long Tu Vertical (LTV) Evaporator supplemented by t Forced Circulation (FC) Evaporators. To obt results which could be translated to commercial stallations, the system was built with sufficie flexibility to permit operation under the conditio which would exist in any effect of a twelve eff system including one stage of thermocompressi The LTV was set up to operate in either a ris film or a falling film mode from either forward backward feed. Experimental work was carr out on both rising film and faling film heat trans coefficients, on scale prevention and on corrosi It was determined that falling film operation p vides better heat transfer than does rising f operation.
W76-06049

3B. Water Yield Improvement

JUDGING THE AVAILABILITY OF GROU WATER.
For primary bibliographic entry see Field 4B.
W76-05558

EFFICIENT WELLS SAVE ENERGY A REDUCE COSTS,
Universal Oil Products, St. Paul, Minn. John Div.
For primary bibliographic entry see Field 4B.
W76-05563

YUKON CITY'S NEW WELL REPLACES F OLDER ONES,
Hydrogeological Consultants Ltd., Edmo (Alberta).
For primary bibliographic entry see Field 4B.
W76-05566

CLASSIFICATION OF METHODS GROUNDWATER MANAGEM (KLASSIFICAKSIIYA METO UPRAVLENIYA REZHIMOM I RESURS PODZEMNYKH VOD),
For primary bibliographic entry see Field 4B.
W76-05600

FIELD OBSERVATIONS OF THE P SISTENCE OF AGI-NH4I-ACETONE NUCLEI IN DAYLIGHT,
Bureau of Reclamation, Miles City, Mont. Di Atmospheric Water Resources Management.
A. B. Super, J. T. McPartland, and J. A. Heimbach, Jr.
Journal of Applied Meteorology, Vol. 14, No. 1572-1577, December 1975. 2 fig, 1 tab, 23 re Rec 14-06-D-6798.

Descriptors: *Cloud seeding, *Silver io *Weather modification, Nucleation, Samp Aircraft, Precipitation(Atmospheric), Arti precipitation, Meteorology.
Identifiers: *Ice nuclei, Ice nuclei persist Silver iodide plumes.

A field method of estimating the persistence commonly used silver iodide seeding agent described. The method involved measureme the AgI plume structure at two down distances from the ground generator(s). Dista between the nine available pairs of down measurement planes ranged from approxim

to 100 km. An NCAR acoustical ice nucleus unter in a light twin aircraft was used to sample e AgI plumes. A series of passes was made rough the entire vertical and horizontal extent of e plume at each downwind distance. These mea- rements, together with pilot balloon observa- ns, permitted calculation of the flux of AgI rough each vertical cross-sectional plane. The ference in flux measurements yielded an esti- te of the persistence of the seeding agent over period of transport between the two vertical nes. This method was applied at three separate ations, during different seasons, and with vari- degrees of cloudiness. Resulting estimates of ctivation rates of the ice nucleating ability of I ranged from no loss to 70% loss per hour. The lications for possible cloud seeding effects ond the intended target area were discussed. ns-ISWS)
6-05677

GIONAL WATER EXCHANGE FOR OUGHT ALLEVIATION,
orado State Univ., Fort Collins. Hydrology and ter Resources Program.
primary bibliographic entry see Field 4A.
5-05819

OUNDWATER STUDY OF A VOLCANIC EA NEAR BANDUNG, JAVA, INDONESIA,
viconsult Ltd., Copenhagen (Denmark).
primary bibliographic entry see Field 4B.
5-05914

LOITATION OF THE WATERS OF SUB- MAFROST ARTESIAN BASINS,
. Gubanov, and B. A. Gubanov.
et Hydrology, Selected Papers, No. 1, p 64- 1974. 1 fig, 2 tab, 7 ref. Translated from raulic Engineering and Reclamation rotekhnika i melioratsiya), No. 2, p 90-92,

riptors: *Permafrost, *Deep wells, *Water ; *Thawing, Irrigation wells, Water wells, ing, Electrical equipment, Electric wires, ric cables.
ifiers: *USSR, *Siberia.

groundwater reserves, of a quality suitable dustrial use and drinking, and representing a le base for agricultural water supply, are ntrated in the subpermafrost artesian basins st Siberia. However, the low temperatures of quifers (0.1-1 C) and the great thickness of the frost (up to 350 m) complicate the exploita- of artesian wells, frequently result in the ng of the water in the wells and thus inhibit ganization of temporary water supply to cul- g pastures, field stations, etc. To prevent eezing of artesian wells, a method of heating ater column in the wells with a linear electric has been developed and introduced into the ce of agricultural water supply. (Sims-ISWS)
5930

CTION AND PRELIMINARY IDENTIFI- ON OF ENDOGENOUS ANTITRANS- NTS IN WATER-STRESSED SORGHUM TS,
ster Univ., Bailrigg (England). Dept. of ical Sciences.
imary bibliographic entry see Field 2I.
6026

Use Of Water Of Impaired ality

AND IRRIGATION SYSTEMS OFFER OMY AND FLEXIBILITY,
n and Works, Grand Rapids, Mich.
mary bibliographic entry see Field 5D.
774

WATER FACTORY 21 IS THE FUTURE,
Toups Corp., Santa Ana, Calif.
For primary bibliographic entry see Field 5F.
W76-05782

DESIGN, OPERATION, AND MONITORING OF MUNICIPAL IRRIGATION SYSTEMS,
Williams and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 5E.
W76-05783

ECONOMIC MAGNITUDES AND ECONOMIC ALTERNATIVES IN LOWER BASIN USE OF COLORADO RIVER WATER,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3A.
W76-05811

PRINCIPAL ECONOMIC ASPECTS OF THE PROBLEM OF SALINITY OF THE COLORADO RIVER,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Relaciones Internacionales.
For primary bibliographic entry see Field 6E.
W76-05821

SALT TRANSPORT IN SOIL PROFILES WITH APPLICATION TO IRRIGATION RETURN FLOW, THE DISSOLUTION AND TRANSPORT OF GYPSUM IN SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-05836

METHOD AND APPARATUS FOR DESALINIZATION OF WATER,
For primary bibliographic entry see Field 3A.
W76-05979

IONIC LEAF ACCUMULATION IN GRAPES, GUAVA AND OLIVE PLANTS AS AFFECTED BY THE SALINITY OF IRRIGATION WATER,
Alexandria Univ. (Egypt). Faculty of Agriculture.
M. W. Taha, E. El-Azab, and Z. Fadiah.
Alexandria J Agric Res. 20(2): 299-309. 1972.

Descriptors: Salinity, Irrigation water, *Fruit crops, *Salt tolerance, Calcium chloride, *Ions, *Leaves, Nitrogen, Nutrients, *Chlorides.
Identifiers: Grapes, Guava, Olea-Europaea, Olive, Psidium-Guajava, Vitis-Vinifera.

One yr old Thompson seedless vines, Roumi red vines (Vitis vinifera), guava (Psidium guajava) and olive (Olea europaea) plants grown in sand culture were irrigated with water containing different concentrations, up to 8000 ppm, of CaC12 plus NaC1 (1:1 ratio). As the salinity level of the water used for irrigation increased, a subsequent increase was observed in the accumulation of C1, Na and Ca in the leaves of the 3 plant species. Accumulation of C1 was much lower in the olive leaves, under all treatments, as compared with the other plants. Tentative critical leaf C1 levels are: 1.50, 1.60, 2.30 and 1.14% for Thompson seedless, Roumi red, guava and olives, respectively. Reduction in growth and appearance of salt injury are expected at higher C1 levels than the suggested ones. Toxicity symptoms together with reduced growth were generally observed when Na in the leaf was over and above 1.50% in the 2 grape cultivars and guava, while in olives values of about 0.75 to 0.90% were critical. The leaf N of the plants showed a slight and irregular increase with increasing the salinity level, indicating no severe salinity effect on N. Both P and K decreased as the salinity level increased, while Mg did not follow any definite pattern under the different treatments.--Copyright 1975, Biological Abstracts, Inc.
W76-06030

THE INTERNATIONAL LAW ASPECTS OF THE GARRISON DIVERSION PROJECT,
For primary bibliographic entry see Field 6E.
W76-06053

3D. Conservation In Domestic and Municipal Use

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alex., Va.
For primary bibliographic entry see Field 5D.
W76-05509

PROCEEDINGS - CONFERENCE ON WATER CONSERVATION AND SEWAGE FLOW REDUCTION WITH WATER-SAVING DEVICES.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W76-05602

HANLON CREEK ECOLOGICAL STUDY, PHASE B.
Guelph Univ. (Ontario). Centre for Resources Development.
For primary bibliographic entry see Field 6G.
W76-05650

PERSPECTIVE 75.
East Central Florida Regional Planning Council, Winter Park.
For primary bibliographic entry see Field 6B.
W76-05651

WATER'S MOST EFFICIENT SYSTEM.
For primary bibliographic entry see Field 6C.
W76-05655

URBAN WATER MANAGEMENT OF AN INTERNATIONAL RIVER: THE CASE OF EL PASO -JUAREZ,
University of Western Ontario, London. Dept. of Geography.
J. C. Day.
Natural Resources Journal, Vol. 15, No 3, p 453-470, July 1975. 6 fig, 1 tab, 50 ref.

Descriptors: *Water management(Applied), *Rio Grande River, *International waters, *Mexico, *River basin development, *Comprehensive planning, Riparian rights, Water demand, *Water policy, Aquifers, *United States, International Boundary and Water Commission, Federal Government, Potential water supply, Arid lands, Legislation, Institutional constraints, Water allocation(Policy), Groundwater, *Texas.
Identifiers: El Paso(TX), Ciudad Juarez(Chihuahua-Mexico).

The experience of El Paso, Texas and Ciudad Juarez, Mexico, adjacent cities located at upstream end of the Rio Grande suggests two problems: difficulties in arid land river basin development and in uncoordinated groundwater appropriation on an international boundary. Institutions and laws which guide water use in both countries and decisions which determine dividing river flow and allocating surface water resources are reviewed. Divergences include water ownership and responsibility for allocation and control. In Texas groundwater belongs to individual property owners for unlimited use, while in Juarez water is owned and controlled by the federal government. Information on water sources and reserves, pricing and rates of use is compared for both countries. Demand schedules indicate that El Paso's consumption is 3 times greater than Juarez which has much less area devoted to lawns and gardens and fewer evaporative coolers and

swimming pools. Chief source of water is from contiguour groundwater fields in the Rio Grande Valley. Saline water underlies, overlaps, and adjoins fresh-water aquifers of the Texas artesian area. All wells must be cased to avoid contamination by salt water into fresh-water stocks. Some conclusions are that the interrelationship of resource use has not been perceived as altering water quality or quantity; international liason to ensure a rational water appropriation policy is needed; and mutually acceptable standards for groundwater protection and development should be established and enforced, probably by the International Boundary and Water Commission. (Salzman - North Carolina).
W76-05661

SUPER TEAMWORK GIVES GREEN BAY (WISCONSIN) A SUPER WASTE TREATMENT PLANT,
For primary bibliographic entry see Field 5D.
W76-05706

REVERSE OSMOSIS PLANT HELPS CITY COPE WITH DIMINISHING GROUNDWATER SUPPLY,
Dacy (G. H.) Associates, Inc., Miami, Fla.
For primary bibliographic entry see Field 5F.
W76-05779

THE MASTER PLAN FOR WATER SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,
Ottawa-Carleton Regional Municipality (Ontario).
For primary bibliographic entry see Field 6D.
W76-05815

RESTORING THE QUALITY OF URBAN RECEIVING WATERS: INTERFACING UPGRADED TREATMENT FACILITIES WITH THE STREAM,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W76-05839

3E. Conservation In Industry

INHIBITION OF SCALE DEPOSITION,
Calgon Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-05529

LEACHING POLYELECTROLYTE FLUIDIZED SOLIDS,
American Cyanamid Co., Stamford, Conn. (Assignee).
For primary bibliographic entry see Field 5D.
W76-05536

METHOD AND APPARATUS FOR CENTRIFUGALLY SEPARATING FINELY DIVIDED SOLIDS FROM AQUEOUS SUSPENSIONS THEREOF,
Canadian Patents and Development Ltd., Ottawa (Ontario). (Assignee).
For primary bibliographic entry see Field 5D.
W76-05543

FILTERING APPARATUS AND PROCESS,
Gaston County Dyeing Machine Co. Mount Holly, N. C. (Assignee).
For primary bibliographic entry see Field 5D.
W76-05546

HOW STEAM IS PRODUCED AND HANDLED AT THE GEYSERS,
For primary bibliographic entry see Field 8C.
W76-05574

PROCEEDINGS - CONFERENCE ON WATER CONSERVATION AND SEWAGE FLOW REDUCTION WITH WATER-SAVING DEVICES.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 5D.
W76-05602

ENERGY REQUIREMENTS FOR CONVENTIONAL AND ADVANCED WASTEWATER TREATMENT,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
For primary bibliographic entry see Field 5D.
W76-05702

EXPERIMENTS ON THE OPTIMIZATION OF SLUDGE DEWATERING AND ON THE USE OF BARK AND SLUDGE IN THE BRICK INDUSTRY (VERSUCHE ZUR OPTIMIERUNG DER SCHLAMMENTWAESSERUNG UND ZUR VERWERTUNG VON RINDE UND SCHLAMM IN DER ZIEGELINDUSTRIE),
Papiertechnische Stiftung, Munich (West Germany).
For primary bibliographic entry see Field 5D.
W76-05704

SUPER TEAMWORK GIVES GREEN BAY (WISCONSIN) A SUPER WASTE TREATMENT PLANT,
For primary bibliographic entry see Field 5D.
W76-05706

SYMPOSIUM ON WATER PURIFICATION (SYMPOSIUM OVER VATTENRENING),
For primary bibliographic entry see Field 5D.
W76-05711

ENVIRONMENTAL ASPECTS OF THE USE OF STARCHES IN THE PAPER INDUSTRY (HLEDISKA OCHRANY ZIVOTNIHO PROSTREDI PRI POUZIVANI SKROBOVYCH PRODUKTU V PAPIRENSKEM PRUMYSLU),
For primary bibliographic entry see Field 5B.
W76-05720

POSITION OF A CALCIUM BISULFITE PULP MILL PARTICULARLY WITH RESPECT TO INTENSIFIED ENVIRONMENTAL PROTECTION REQUIREMENTS (DIE POSITION EINER KALZIUMBISULFITFABRIK, BESONDERS IM HINBLICK AUF VERSCHAERFTE UMWELTSCHUTZFORDERUNGEN),
Helsinki Univ. of Technology, Otaniemi Finland.
For primary bibliographic entry see Field 5G.
W76-05722

REDUCTION OF EFFLUENT VOLUME AND FRESH WATER CONSUMPTION (SNIZHENIE OB'EMA CTOCHNYKH VOD I RASKHODA SVEZHEJ VODY),
Vsesoyuznyi Nauchnii Planovii Otdel Bumazhnoi Promyshlennosti Moscow (USSR).
G. L. Akim, and T. A. Bystrova.
Bumazhnaya Promyshlennost, No. 8, p 17-20, Aug., 1975. 1 fig, 1 tab.

Descriptors: *Water conservation, *Pulp and paper industry, *Bleaching wastes, Sulfite liquors, Wastes, Industrial wastes, Pulp wastes, Water pollution sources, Biological treatment, Biochemical oxygen demand, Chemical oxygen demand, Recycling, Oxidation, Water consumption (except consumptive use), Foreign countries.
Identifiers: *Sulfite pulp mills, Dissolving pulp, Spent sulfite liquor, Soviet Union(USSR).

A process has been developed for the manufacture of sulfite dissolving pulp in which the cooking liquor is prepared from spent liquor of oxygen-kali bleaching. There is no chlorination, the p after the oxygen-alkali treatment being bleach with hypochlorite dioxide. Following oxygen-kali treatment the liquor (5.5-6.5 cu m/ton of pu is squeezed out, and the liquor containing 4-6 g sodium oxide/liter is used for the preparation cooking liquor. The pulp is washed and the w water is used for the preparation of NaOH so tion and for pulp dilution prior to oxygen-al treatment. Spent bleaching liquors are used pulp dilution after bleaching and for unbleach pulp screening. Spent liquor from bleached p acidification is also used for this purpose. water consumption is drastically reduced, about 95% sodium oxide is recycled into process. The spent sulfite liquor, which has a h content of organic and inorganic substances used for biological processing so that the f overall effluent from the process contains sp liquor from hypochlorite bleaching and 5% spent liquor from oxygen-alkali treatment. BOD and COD, compared to the conventi process, are very low, and it is easily purified biological oxidation. (Stapinski-IPC)
W76-05727

TRANSFER OF LINDANE FROM BARK OF SECTICIDE-SPRAYED PINE PULPWOOD IN EFFLUENT FROM A BARKING DR (LINDAANIN HUUHTOUTUMISES SUOJARUISKUTETUN MANTYKUITUPU KUORESTA RUMPUKUORIM JATEVETEEN),
Finnish Forest Research Inst., Helsinki.
For primary bibliographic entry see Field 5B.
W76-05734

UTAH'S THIRD YEAR OF PLANNING I THE FOUR CORNERS REGIONAL COMM SION,
Utah Planning Commission, Salt Lake City.
For primary bibliographic entry see Field 6B.
W76-05827

COMPARATIVE RISK-COST-BENEFIT ST OF ALTERNATIVE SOURCES OF ELEC CAL ENERGY,
Atomic Energy Commission, Washington, D.
For primary bibliographic entry see Field 6B.
W76-05829

WATER-RESOURCES INVESTIGATIONS THE U.S. GEOLOGICAL SURVEY IN NORTHERN GREAT PLAINS COAL REG OF EASTERN MONTANA, 1975-76,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W76-05853

THE ECONOMICS OF CLEAN WA VOLUME III. INDUSTRY EXPENDITURES WATER POLLUTION ABATEMENT.
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W76-05951

METHOD OF REDUCING SLUDGE ACCU LATION FROM TAR SANDS HOT WA PROCESS,
Great Canadian Oil Sands Ltd., Toronto (Ont (Assignee).
For primary bibliographic entry see Field 5D.
W76-05965

METHOD OF EXTRACTING HEAVY MET FROM INDUSTRIAL WASTE WATERS,
Nippon Electric Co. Ltd. Tokyo (Ja (Assignee).
For primary bibliographic entry see Field 5D.
W76-05966

ROCESS FOR THE TREATMENT OF INERAL SLIMES,
max Resource Recovery Systems, Inc., Dayton, hio. (Assignee).
or primary bibliographic entry see Field 5D.
76-05973

RIFICATION OF WASTE WATER CONAINING PHTHALIC ESTERS,
hone-Progil, Courbevoie (France). (Assignee).
or primary bibliographic entry see Field 5D.
76-05982

ORTHERN GREAT PLAINS RESOURCE PROAM.
orthern Great Plains Resources Program, nver, Colo.
r primary bibliographic entry see Field 6D.
76-06050

FORMING PROCEDURES FOR INDUSTRI- SITING,
primary bibliographic entry see Field 6E.
6-06058

. Conservation In Agriculture

TER LINE,
flex S.P.A., (Italy). (Assignee).
Brusadin, and G. Prosdocimo.
S. Patent No. 3,929,288, 4 p, 9 fig, 6 ref; Offi- Gazette of the United States Patent Office, . 941, No 5, p 2130, December 30, 1975.

criptors: *Patents, *Water distribu- (Applied), *Irrigation, *Irrigation systems, ines, Irrigation efficiency, Pipes, Flow con-

tifiers: Flexible pipe.

device described allows a rapid and easy con- tion of water distribution systems with flexi- pipes. The distribution system can be laid out he surface of the ground or completely un- round. The device connecting distribution and providing for branches comprises a box having an open top and at least two lateral etrially opposed openings. A cover selective- oses the top of the box. A duct body posi- d in the box has two lateral projections, one extending toward one of the lateral openings e box body, and a centrally located upward ding projection extending toward the open f the box. The upward projection has a nozzle oupling to a water utilization device and con- g an automatic valve. The duct body forms onnected passages through each of the l projections and the upward projection. The an be secured to the ground. (Sinha - OEIS) 05541

WANCE FOR PRECIPITATION AND RU- FLUCTUATION PATTERNS IN COM- NG WATER WITHDRAWAL FOR IR- TION SYSTEMS IN THE SOUTHERN AINE,
nskii Nauchno-Issledovatelsi meteorologicheski Inst.(USSR).
imary bibliographic entry see Field 4A.
5675

COLUMBIA BASIN PROJECT REAP- ED,
l Washington State Coll., Ellensburg.
imary bibliographic entry see Field 4A.
5750

WATER RESOURCES DEVELOPMENT IN THE GANGA-GHAGRA INTERBASIN IN UTTAR PRADESH (INDIA),
Central Board of Irrigation and Power, New Delhi (India).
For primary bibliographic entry see Field 4A.
W76-05763

IMPACT SPRINKLER,
Johns-Manville Corp., Denver, Colo. (Assignee).
C. W. Dunmire.
U.S. Patent No. 3,930,617, 5 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 308, January 6, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, Irrigation efficiency, Application equipment, Water distribution(Applied).
Identifiers: *Impact sprinkler, Plastic.

An impact sprinkler has a plastic water deflector and an improved water distribution pattern specifically at the outlying areas of the pattern. The sprinkler comprises a main body including a nozzle and a cylindrical water deflector support pin around which a water deflector is pivotally mounted. The water deflector is constructed of plastic and includes a water deflecting segment movable into and out of a jet of water issuing from the nozzle as the deflector pivots about the support pin. The water deflecting segment includes a first substantially flat water deflecting surface which extends away from the nozzle and which includes opposite ends, one end of which is further from the nozzle than the other, and opposite sides extending between the opposite ends. The water deflecting segment also includes a pair of second water deflecting surfaces extending out from and joining the further end of the first surface. These second surfaces extend towards each other from opposite sides of the first surface but are spaced from one another so as to define a slot between. The slot is centrally located between the sides of the first surface. In this manner the water in the center of the jet deflects off the first surface and passes through the center slot without being deflected by the outwardly directed second surfaces, allowing it to pass further out from the sprinkler than the water deflected by the second surfaces. (Sinha-OEIS)
W76-05956

BALANCED SPRINKLER IMPACT DRIVE,
G. Lockwood.
U.S. Patent No. 3,930,618, 4 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 308, January 6, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Application equipment, Water distribution(Applied).
Identifiers: *Impact sprinklers.

A sprinkler has a radially dynamically balanced intermittent drive system to provide a rotating sprinkler head generally free of all objectionable vibrations. The drive system includes a striker carrier and at least two independent striker means, shown as balls. The striker means are symmetricallt positioned by the striker carrier and their generally rotary path is prescribed to radially dynamically balance the carrier member and striker means as a drive system. The driver surface means and the striker means are positioned so that a number of impacts occur simultaneously to provide an intermittent impact drive that is free of radial vibrations and therefore this sprinkler may be placed at great heights on stand pipes without encountering vibration problems. (Sinha-OEIS)
W76-05957

WATER MOVEMENT WITHIN THE ROOT ZONE OF IRRIGATED AND NONIRRIGATED GRAIN SORGHUM,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 2G.
W76-05994

ROLE OF PHENYLMERCURIC ACETATE ON STOMATAL REGULATION AND WATER LOSS IN PROSOPIS CINERARIA LINN,
Jodhpur Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 5G.
W76-06011

THE ANNUAL VARIATION IN YIELD OF PASTURES IN THE SEASONALLY DRY TROPICS OF QUEENSLAND,
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Pastoral Research Lab.
R. L. McCown, P. Gillard, and L. A. Edye.
Aust J Exp Agric Anim Husb. 14(68): 328-333. 1974.

Descriptors: *Australia, Vegetation, *Evapotranspiration, Dry farming, Seasonal, Pastures, Tropics, *Crop production.
Identifiers: Cenchrus-Ciliaris, Heteropogon-Contortus, Queensland, Stylosanthes-Humilis.

Dry matter yield of 3 vegetation (Heteropogon contortus, Stylosanthes humilis and Cenchrus ciliaris)-fertilizer combinations was closely related to actual evapotranspiration estimated using simple water balance model. Cumulative actual evapotranspiration was estimated for 69 yr of rainfall records and a description of annual variation in yields obtained using yield/actual evapotranspiration regressions. --Copyright 1975, Biological Abstracts, Inc.
W76-06016

EFFECT OF DIFFERENT METHODS OF PLANTING IN PUDDLED SOIL ON THE YIELD OF RICE,
V. Venkateswara Rao.
Indian J Agric Sci. 43(6): 551-554. 1973.

Descriptors: *Rice, *Crop production, Farm management, *Planting management, Seeds.

A study was conducted for 3 seasons to find out the best method of growing rice (Oryza sativa L.) cultivars ('IR 8,' 'IR 20,' 'Jaya' and 'Co 29') in puddled soil. Dibbling sprouted seed in 15-cm solid rows was on a par with transplanting in the rainy season and was superior to other methods in winter for grain yield. Considering the yield and economics, dibbling sprouted seed of 'IR 8' in solid rows 15 cm apart showed a great potential. This method eliminates nursery preparation, fertilization, care, pulling, transporting and planting seedlings, reduces labor requirement at planting, and enables the winter crop to escape moisture stress at the grain-filling stage as it matures a week earlier than the transplanted crop.--Copyright 1975, Biological Abstracts, Inc.
W76-06017

SOME HELMINTHS OF BULINUS TRUNCATUS AND BIOMPHALARIA ALEXANDRINA FROM THE IRRIGATION SYSTEM NEAR CAIRO,
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
For primary bibliographic entry see Field 5A.
W76-06028

GRAPEVINE RESPONSE TO FURROW AND TRICKLE IRRIGATION,
New York State Coll. of Agriculture, Ithaca. Dept. of Pomology.
R. E. Smart, C. R. Turkington, and J. C. Evans.
Am J Enol Vitic. 25(2): 61-66. 1974.

Descriptors: *Furrow irrigation, *Trickle irrigation, Crop production, Growth rates, *Australia.
Identifiers: *Grapevine growth.

The effects of trickle and furrow irrigation were determined on yield and growth of the wine grape 'Shiraz' in the hot arid climate of Griffith, New South Wales (Australia). Daily trickle irrigation applied at 0.4 the rate of class A pan evaporation (crop factor=0.4) produced similar yields to furrow irrigated vines with crop factor 0.5. Daily trickle application with crop factor of 0.2 decreased yield by 16%. Applying similar amounts of water daily or every 2nd day by trickle had similar effects on yield. Water stress up to veraison significantly reduced berry size, the yield component most sensitive to water stress.--Copyright 1975, Biological Abstracts, Inc.
W76-06032

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

SOCIOLOGICAL ANALYSIS OF DAM IMPACT: A STUDY OF TWENTY-TWO LARGE DAMS IN TEXAS,
Texas A and M Univ., College Station. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W76-05501

RESERVOIR MANAGEMENT VIA RELIABILITY PROGRAMMING,
Politecnico di Milano (Italy). Istituto di Elettrotecnica ed Elettronica.
A. Colorni, and G. Fronza.
Water Resources Research, Vol 12, No 1, p 85-88, February 1976. 3 fig, 15 ref, append.

Descriptors: *Reservoirs, Management, *Reliability, *Reservoir releases, Monthly, Volume, *Reservoir operation, Profit, Risks, Algorithms, Stochastic processes, Optimization, Equations, Mathematical models, Systems analysis.
Identifiers: *Chance-constrained programming, *Nonlinear programming.

The possibility of applying reliability programming for determining the monthly contract volumes to be released by a reservoir is discussed. While in standard chance constraint programming the risk of the solution is fixed a priori, here constraint reliabilities are considered as extra decision variables. Hence the optimal operation results from a compromise between profit and risk. It is shown that under quite general assumptions the reliability program enjoys a concavity property that allows the application of an efficient solution algorithm. An extension of the results to the multi-reservoir case as well as to problems characterized by additional storage and/or outflow constraints or by operating rules looks possible. (Bell-Cornell)
W76-05508

ENVIRONMENTAL CONSIDERATIONS IN RIVER BASIN PLANNING AND DECISION MAKING,
Arizona Univ., Tucson, Inst. of Renewable Natural Resources.
M. M. Fogel.
Working Paper No 5, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 16 p, 18 ref.

Descriptors: *River basin development, *Decision making, *Environmental effects, *Planning, Projects, Ecology, Assessment, Economics, Social aspects, Forecasting, Downstream, Water utilization.
Identifiers: Impact analysis, Developing countries, Environmental quality.

Decisions to implement river basin projects should be based not only on economic feasibility but also on the impacts the project may have on the environment. The effects of water resources projects are felt in the area of impoundment (if dams are built), downstream from impoundment and/or diversion and in the areas where the water is used. Ecological impacts including technical, economic and social considerations should be assessed and evaluated for all possible alternatives that meet project goals. While the means to measure the physical, chemical and biological parameters of the environment are adequate, the ability to predict the response of whole ecosystems to manipulation is less than adequate. Also, since a framework for assessing the social aspects of a river basin project still needs devising, selection of a preferable alternative is a matter of judgement and of value. Thus, much of the selection process will center on defining the relative utilities of the costs, benefits and the environmental impacts. Decision makers are faced with considering environmental effects either the primary constraint to development as advocated by some leading scientists, or in proportion to public pressure and secondary to engineering and economic constraints as is done in current practice. As recommended strategies, developing countries should set a high priority on broadening their knowledge and information of the environmental field. They should also integrate environmental planning and regard environmental improvement as one of the multiple objectives of planning. (Bell-Cornell)
W76-05510

THE ROLE OF INLAND NAVIGATION IN RIVER BASIN DEVELOPMENT,
Magyar Tudomanyos Akademia, Budapest (Hungary).
G. Fekete.
Working Paper No. 7, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 18 p, 2 fig. (United Nations, Department of Economic and Social Affairs)

Descriptors: *River basin development, *Inland waterways, *Navigation, Industries, Water demand, Communication, Economics, National income, Networks, Water transfer.
Identifiers: Water transport, Flow diagram, Socio-economic results.

The waterway offers as a matter of course two primary pre-conditions necessary for the development in general, and for the settlement of industry in particular: the meeting of water demands and affording large transport capacity. Waterway connections link various regions and thus, over a developing waterway network, interregional transport will become possible, creating a unique situation and endowments all over the world for settlement development bringing a new prosperity unparalleled both in countries directly /riparian/ and indirectly /connected by waterway/ concerned. The 'environment friendly' nature of water transport is rather well known and its development involves a 'chain reaction' in the region or regions concerned, exerting stimulating economic effect on the interlinked waterways, on the attracted zones. A more rational and/or more organized communication by making use of the cheap water transport will result in savings in cost and can contribute to the virtual increase of the total national income. Following the 'interdisciplinary logical flow diagram of navigation,' the minimization of freight can be achieved and the 'know-how' of legal, administrative, commercial, nautical, technical, economic, etc., preconditions of intraregional and interregional waterway utilization can be readily obtained. (Bell-Cornell)
W76-05511

SYSTEMS APPROACH TO RIVER BASIN A INTERBASIN DEVELOPMENT,
Washington Univ., Seattle.
B. W. Mar.
Working Paper No. 9, UNDP/Un Interregio Seminar on River Basin and Interbasin Deve ment, Budapest, Hungary, September 1975. 13 fig. (United Nations, Department of Econo and Social Affairs)

Descriptors: *River basin development, *Syst analysis, Analytical techniques, Control, De Planning, Constraints, Resources, River syste Economics, Hydrology, Dams, Computers, timization, Mathematical models, Alterna planning.
Identifiers: *Interbasin development, Hy sphere.

Systems approaches to river basin ana acknowledge the contribution of all known sy components and provide a process to identif relative importance of each component. Com understanding of any one individual compo does not necessarily insure proper system a sis, since the neglected or less known compo can dominate the system response. Thus det knowledge of physical hydrology and geology engineer are inadequate to perform compre sive system studies. Comparable data mu available for economic, demographic, s political and ecological components of the basin system to permit adequate analysis. Fe dividuals have the perception and tolerance t gage in analyses which employ iterative se analysis at differing levels of precision an willing to employ methodologies best suite these different levels of analyses. Experts wi detailed or too broad a view will create se delays in such iterative system approaches they will demand particular levels of prec whether the analysis requires it or not. The problem in the implementation of the systen proach is to obtain consensus among the a concerning the resolution of data required specific issues to be examined, and the le system abstraction necessary to address the sues. Herein, various types of systems an procedures are classified and examples of the plication to river basin development are pres (Bell-Cornell)
W76-05512

UNCERTAINTY IN WATER RESOU DECISION MAKING,
Water Resources Center, Budapest (Hungary
For primary bibliographic entry see Field 6A
W76-05513

A CASE STUDY REPORT ON THE VIS RIVER BASIN,
Technical Univ. of Warsaw (Poland). Inst. vironmental Engineering.
J. Kindler.
Working Paper No. 11, UNDP/UN Interre Seminar on River Basin and Interbasin De ment, Budapest, Hungary, September 1975. fig, 1 tab, 8 ref. (United Nations, Departm Economic and Social Affairs)

Descriptors: *River basin develo :Comprehensive planning, *Water m ment(Applied), *Control, Evaluation, Inves Projects, Water supply, Flood control, Wat lution control, Multiple-purpose reservoirs, lation analysis, Optimization, Strea Methodology, Economic feasibility, Mathe models, Systems analysis.
Identifiers: *Vistula River Basin(P Developing economies, Target demand co Multiobjective planning.

This paper is concerned with the planning s adopted for preparation of the UNDP/UN Fund Project 'Planning Comprehensive De ment of the Vistula River System.' It begins

brief description of the Vistula River Basin which covers about 54% of the area of Poland. The Basin is a region of rapidly developing economy with a large number and variety of problems confronting water management. Discussion of planning strategy covers such topics as the spatial and problem-oriented decomposition of the system, identification of water control objectives, and application of mathematical modeling techniques for evaluation of the alternative water resources development (investment) programs. Finally, some comments on the target demand concept and possibilities of streamflow synthesis are offered. (Bell-Cornell)
W76-05514

THE OUT-OF-KILTER ALGORITHM AND SOME OF ITS APPLICATIONS IN WATER RESOURCES,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W76-05515

RIVER BASIN MODELS AND THEIR APPLICATION WITH SCARCITY OF DATA.
World Meteorological Organization, Geneva (Switzerland).
Working Paper No. 13, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 11 p, 1 tab, 12 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *River basin development, *Mathematical models, Hydrology, Planning, Operations, *Data acquisition, Networks, Design, Management, Forecasting, Reservoirs, Hydraulic structures, Systems analysis, Model studies.
Identifiers: *Data scarcity, Interbasin development, Conjunctive design.

The activities and system of work of the World Meteorological Organization (WMO) in the field of hydrology and water resources are briefly summarized. The importance, changing needs and new trends in the use of water data are reviewed. Potential river basin and interbasin development should not be postponed until more data are collected; the essence of a river model is to permit reaching a solution with the limited data available. The latest sophisticated planning and operational models used in water resources development are in trouble because of the lack of basic data needed to calibrate the models' parameters, to evaluate the performance of the model, and to test the effectiveness of the river basin development projects. The influence of improved methods of data acquisition on the development of river basin models is discussed together with a brief review of WMO published guidance material describing the objectives and practice of hydrological network design and the principles of conjunctive design of various kinds of networks. The use of river basin models in water resources management and in hydrological forecasting is discussed with an analysis of the problems arising between the interests of the water user and the operational water requirements of reservoir and related hydraulic structures. The WMO project on the intercomparison of conceptual models used in operational hydrological forecasting is described also. (Bell-Cornell)
W76-05516

REVIEW OF SOME HYDROLOGICAL STUDIES REQUIRED IN THE DESIGN OF WATER MANAGEMENT PROJECTS.
World Meteorological Organization, Geneva (Switzerland).
Working Paper No. 14, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 7 fig, 6 tab, 7 ref.

Descriptors: *Water resources, *Management, *Design, *Hydrologic data, *Projects, Operations research, Estimating, Water supply, Evaluation, Probability, Time series analysis, Reservoir storage, Flow, Volume, Duration curves.
Identifiers: *Reservoir capacity.

Hydrological and related meteorological data are collected to provide information for developing and managing the water resources of a country as well as for operational purposes and research. There is therefore an immediate need to plan and establish data networks of minimum acceptable density. Guidance material on the planning and establishment of data networks has and continues to be published by the World Meteorological Organization. This paper reviews the various methods used in the estimation of the available water supplies of a project. The factors to be evaluated in a surface water supply study are listed. Synthesis of hydrological data involving tests of project adequacy and operation using a probabilistic approach and the time series approach are reviewed. Graphical presentations describing the approach, such as duration curves, volume-duration-frequency curves, low-flow-frequency curves, and volume-discharge-frequency curves are reviewed. In the time series approach, the sequential order of the flows is considered in addition to their probabilities. In the use of this approach, for the analysis of water yield, both the cumulative sums method and the simulated time series method are briefly described. Estimation of the required reservoir storage capacity involves water supply-draft-storage studies. Again, both the probabilistic approach and the time series approach are reviewed. An example is given with a table of probabilities for the various contents of the reservoir, and the use of storage draft relationships to find the optimal reservoir capacity is described. (Bell-Cornell)
W76-05517

RECENT TRENDS IN WATER QUALITY MANAGEMENT AND PROTECTION IN HUNGARY,
National Water Authority, Budapest (Hungary). Water Pollution Control.
For primary bibliographic entry see Field 5G.
W76-05518

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
I. Z. Ballo, and I. Orloczi.
Working Paper No. 16, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 27 p, 5 fig, 5 tab, 12 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water resources development, *River basins, *Land use, *Water management(Applied), *Water supply, *Planning, Economics, Social aspects, Surface waters, Human population, History, Floods, Irrigation, Water pollution control, Water demand.
Identifiers: *Tisza River basin(Hungary), *Developing economies, Impact, Socioeconomic growth, Catchments, International cooperation.

A brief review is presented of the fundamental water management conditions related to land use in the Tisza River Basin, an area of great economic importance to Hungary. The time horizon surveyed comprises two centuries: from 1800 to 2000. The past, present and future socio-economic significance of the Hungarian part of the Tisza Valley is emphasized. The main stages, characteristics, problems, and results of the past 150 years' long history of increasingly complex water management are surveyed. Taking into consideration the projections for the Hungarian part of the basin presently available and the development predicted for the neighboring countries in the catchment, an attempt is made at estimating the needs likely to be raised by the growing population and the developing economic life in the region. The technico-economic and political measures outlined broadly are potential solutions to the problems formulated. Reference is made to the co-operation of the five CMEA neighboring countries and the work started is expected to provide novel experiences for the integrated development of other international river basins of the World in the near future. (Bell-Cornell)
W76-05519

VIEWS ON RIVER BASIN DEVELOPMENT IN THAILAND,
Bangkok Metropolitan Water Works Authority (Thailand).
B. Binson.
Working Paper No. 18, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 18 p, 2 fig, 4 tab, 5 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *River basin development, *Water resources, Agriculture, Economics, Flood control, Planning, Projects, Reservoir storage, Hydrologic data, Water allocation(Policy), Environment, Hydroelectric power.
Identifiers: *Thailand, Developing countries, Multiple purpose.

The economy of Thailand is characterized by agriculture; development of agroindustry is another aspect towards which the country is moving. Development of water resources is of utmost importance in reaching the desired objectives. Following the energy crisis, development of hydropower must be given special attention but should be in pace with other aspects, such as irrigation. This opportunity cannot be fully seized as yet due to the economic handicaps and the war situation in neighboring countries. Nevertheless, progress in water resources development is considered to be satisfactory, even though the scarcity of capital for investment places constraints on achieving integrated water resources development and reflects on the planning strategies. Efforts are being made to improve outputs of projects and increase farmers' income through various means such as education, expansion of irrigation distribution systems, increase of multi-purpose co-operatives, and land consolidation measures. In the face of capital constraints and the increasing need for food and fibre, careful planning, design, and evaluation of projects are necessary. The planning of water resources in Thailand now takes full account of social, economic and environmental aspects. In terms of the desirable goals and purposes for development, systems analysis seems an attractive tool for the planning of river basin development. Tremendous progress can be made and unprecendented benefits realized as soon as peace in the region is restored. (Bell Cornell)
W76-05520

GOALS AND FORMS OF CO-OPERATION AMONG COUNTRIES FOR THE DEVELOPMENT OF INTERNATIONAL RIVER BASINS,
Research Inst. for Water Resources Development, Budapest (Hungary).
B. Csermak.
Working Paper No. 19, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1976. 14 p, 10 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water resources, *River basin development, *Water management(Policy), Benefits, Water law, Governments, Planning, Water quality, Water utilization.
Identifiers: Developing countries, *International cooperation.

The purpose of international cooperation on water problems is to create advantageous conditions for water management activities and to facilitate the exploitation of benefits accruing from the international division of labor. The essence of water management could be defined as an activity aimed at an optimal coordination and harmonization of the natural household of water resources with the needs of the society by means of planned scientific, technical, economic, administrative and legal measures. The most effective method of resolving international water management problems is the direct cooperation based on bilateral or multilateral agreements between the parties concerned. In order to avoid disputes and to establish a peaceful, fraternal milieu for negotiations, agreements should be based on principles codified in international water law. As a first step for the preparation of codification, it would be most desirable if the UN would decide to: (1) review and modernize its most valuable work published in 1963 under the title, 'Legal Problems Relating to the Utilization and Use of International Rivers;' and on the basis of this work (2) prepare a recommendation on the forms and contents of agreements on international water problems to be accepted by the governments. (Bell-Cornell)
W76-05521

LINE MOTION AND WATER CURRENT DISC SENSOR,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
For primary bibliographic entry see Field 7B.
W76-05539

FLOWMETER FOR AN OPEN AQUEDUCT,
Yamatake-Honeywell Co., Ltd., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 7B.
W76-05540

WATER LINE,
Uniflex S.P.A., (Italy). (Assignee).
For primary bibliographic entry see Field 3F.
W76-05541

GROUND WATER IS THE ONLY REAL RESERVE THIS COUNTRY HAS.
For primary bibliographic entry see Field 4B.
W76-05567

QUURM - A REALISTIC URBAN RUNOFF MODEL,
Queen's Univ., Kingston (Ontario).
For primary bibliographic entry see Field 2A.
W76-05577

PRECIPITATION MANAGEMENT FOR RECLAMATION OF OVERGRAZED AREAS IN ARID AND SEMI-ARID REGIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-05603

SUPPLY AND DEMAND IN WATER PLANNING: STREAMFLOW ESTIMATION AND CONSERVATIONAL WATER PRICING,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6D.
W76-05607

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOL. II OF V. ESTIMATING INITIAL RESERVOIR RECREATION USE,
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 6B.
W76-05611

THE HYDROLOGIC POTENTIAL OF UNIT AREAS: A BASIS FOR MANAGING WATER RESOURCES,
Forest Service (USDA), Berkeley, Calif., Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-05620

FLOOD HAZARD ANALYSES: BUFFALO RIVER, AMHERST COUNTY, VIRGINIA.
Soil Conservation Service, Richmond, Va.
September 1974. 14 p, 6 fig, 22 plates, 2 tab

Descriptors: Floods, *Flood profiles, *Hurricanes, *Floodways, *Flood plains, *Flood protection, *Flood plain zoning, Runoff, Flooding, Maximum probable flood, Historic floods, Flood data, Peak discharge, Control structures, *Virginia.
Identifiers: *Buffalo River(Va), Hurricane Camille, Hurricane Agnes, 100-year flood, 50-year flood.

The Buffalo River rises on the eastern slope of the Blue Ridge Mountains and slopes at an average of 18 ft/mi through the 18 mi long study area. Drainage at the upper and lower limits of the area are 16 and 95 sq mi respectively. Prior to 1969 the largest flood had a flow of 20,000 cubic feet per second 1943 and 1944. In 1969 Hurricane Camille dumped rainfall estimated at 15 inches in 8 hours on the watershed causing a peak discharge of 45,000 cfs, much larger than a 100-year flood. Normal annual precipitation is 45 inches. Hurricane Agnes in 1972 produced a peak discharge of 36,000 cfs. Both floods caused damage in the study area, though land use is limited in its development. Most of the watershed is woodland (74%) or pasture (24%). To estimate future floods, peak discharges were determined by flood routing using computers. These discharges were correlated with stream gage records and retarding structures were simulated to show the effect on flood peaks. Hurricane Camille was used as a base. Five categories of uses are suggested and for each the degree of required protection is stated. Power installations, emergency facilities, etc. require maximum protection whereas low-value cropland requires the minimum of protection. The locations of temporary benchmarks installed for the study are included. Permanent benchmarks should be installed where they are used frequently for determining the limitations of the 100-year flood zone, the Hurricane Camille flood area and limits of the protected area if a proposed flood control project is built. These zones are delineated on accompanying maps. (Smith - North Carolina)
W76-05643

FLOOD HAZARD ANALYSES: BLACKS RUN-COOKS CREEK, ROCKINGHAM COUNTY AND HARRISONBURG, VIRGINIA.
Soil Conservation Service, Richmond, Va.
September 1974. 22 p, 8 fig, 31 plates, 1 tab.

Descriptors: Floods, *Flood profiles, *Floodways, *Flood plains, *Land use, *Bench marks, *Flood protection, *Flood plain zoning, *Floodproofing, Runoff, Maximum probable flood, *Virginia.
Identifiers: 100-year flood, 500-year flood, Harrisonburg(Va), Blacks Run(Va), Cooks Creek(Va), Park View(Va), Dayton(Va).

Population in the watershed of this study was 12,000 in 1949 and in the past 25 years has increased 60%. The drainage area of the two creeks is 43 sq mi. Cooks Creek is a tributary of Blacks Run which rises near Park View and flows south through Harrisonburg. Because development has increased the amount of land which is impervious to water, volumes and peak flows of floods have increased so that some older bridges and culverts are now inadequate. The trend is expected to continue and this study makes assumptions about land coverage 10 to 15 years from now to anticipate future runoff. In 1949 a large flood caused 3 ft o water in downtown Harrisonburg. Losses fro lesser floods have been limited to agricultura road and bridge damages. To predict future flood physical parameters, present land use condition and peak discharges of storms of varying ma nitudes were considered through flood routi with computer facilities. These analyses were co related with stream gage records and with oth available data to establish frequency-dischar relationships in the study area with present la use. Anticipated land use was included in a seco computer run. Proposed floodwater retardi structures were not taken into account because is doubted that they will be built. Predicted flo plains can be located on the ground by using te porary benchmarks set for this study. It is su gested that these benchmarks be made permane Five categories of uses or facilities and degree required protection are outlined. (Smith - Nor Carolina)
W76-05644

FLOOD PLAIN INFORMATION: ILLINOIS AN MICHIGAN CANAL, ROCK RUN CREE THORNE CREEK, JOLIET, ILLINOIS.
Army Engineer District, Chicago, Ill.
Prepared for the City of Joliet, March 1975. 42 27 fig, 14 plates, 7 tab.

Descriptors: *Floods, *Flood profiles, *Flo plains, Streamflow forecasting, Historic floo Flow duration, Peak discharge, Snowmelt, C structions to flow, Flood plain zoning, *Illinois.
Identifiers: *Standard Project Floo *Intermediate Regional Flood, *Illinois a Michigan Canal(Il), Rock Run Creek(Il), Thor Creek(Il), Des Plaines River(Il), Joliet(Il).

Areas adjacent to the creeks of this study are sidential and commercial and along the Illinois a Michigan Canal there are also industrial prop ties. Flood plains are not highly developed present with some industrial property, a munici sewage treatment plant and a few residences Rockdale. Population of Joliet continues to past the 1970 figure 78,804 an increase of 18% decade. The now abandoned canal with a chan width varying from 40 to 160 ft, about-6 ft de serves as a drainage area for about 19 sq mi in vicinity. Thorne Creek, with a steep channel slo drains 1.63 sq mi while Rock Run Creek dra 14.2 sq mi. Floods occur due to intense rain from March to October. Between 1866 and 19 18 floods have caused damage in Joliet. In event of an Intermediate Regional Flood a pe discharge of 600 cfs on Thorne Creek at the I & canal 2400 cfs on Rock Run Creek at the I & canal and 2175 cfs at Rock Run Creek: South the Des Plaines River including overflows fr the canal) are expected. Water velocities of up 7.12 ft/sec in the channel and 1.81 ft/sec in overbank are predicted. Floods rise quickly tak about 12 hours to reach peak discharge. In a St dard Project Flood peak discharges of 1550 c 7350 cfs and 8500 cfs are expected on Tho Creek, Rock Run Creek and Rock Run Cree South respectively. Water velocities up to 10 ft/sec in the channel and 2.31 ft/sec in the ov bank are possible. Floods may damage residen and industrial areas. Most of the 41 bridges acr the creeks and canal would be obstructive to fl There are no flood control structures. (Smit North Carolina)
W76-05645

SPECIAL FLOOD HAZARD INFORMATI REPORT: HOWELL CREEK BASIN LAK ORANGE COUNTY, FLORIDA,
Army Engineer District, Jacksonville, Fla.
Prepared for the Orange County Board of C missioners, March 1974. 15 p, 1 fig, 4 plates, 1 t

Descriptors: *Floods, *Flood plains, *Fl stages, *Flood frequency, *Flood profiles, S face runoff, Flood forecasting, Aquifers, Grou water, Lakes, Lake sediments, *Florida.

dentifiers: Orange County(FL), Howell Creek Basin(FL), Coincident frequency method, Orlando(FL), Winter Park(FL), Standard Project Flood, 0 year flood, 25 year flood, 50 year flood, 100 ear flood, Stage frequency relation, Stage duraion relation, Rainfall frequency relation.

he Howell Creek basin drains about 50 sq mi of range County and encompasses the suburban reas of Maitland, Winter Park and the northern alf of Orlando. High levels in the 69 lakes for hich data are presented have caused flooding in e Howell Creek basin. Evaluations of the extent d severity of the 10, 25, 50 and 100 year floods d the Standard Project Flood are presented. evelopment now exists in the flood plain and a reater demand for building sites within the flood ain is expected as development of the area conues. Factors influencing lake stage include rain, aporation, surface inflow, surface outflow, and e quantity of groundwater inflow and outflow hich is determined by the relative levels of the ke and the adjoining water table, and by the ysical characteristics of the lake sediments and e groundwater aquifer. Since the available lakege data are not adequate for a conventional equency analysis, a 'coincident frequency' ethod was adopted for stage frequency deternation. This method involves superimposing an cremental increase in lake stage due to surface noff on an antecedent lake stage determined m stage duration curves, and determining the nt probability of various combinations of these. riables used to determine a stage frequency ation by this method are (1) stage duration rela n (2) rainfall frequency relation and (3) the ratio lake surface area to impervious drainage area ofs and pavements). (Henley - North Carolina)
76-05646

OOD PLAIN INFORMATION: COASTAL EAS, LEVY COUNTY, FLORIDA.
my Engineer District, Jacksonville, Fla.
epared for the Board of County Commissioners Levy County. June 1973. 31 p, 8 fig, 26 plates, 3 .

scriptors: *Floods, *Tides, *Hurricanes, ood plains, *Flood profiles, *Tidal waters, nds, Historic floods, Flood peak, Warning tems, *Florida.
ntifiers: Levy County(FL), Cedar Key(FL), nkeetown(FL), Storm tides, Gulf of Mexico, ndard Project Tidal Flood, Standard Project rricane, Intermediate Regional Tidal Flood, Inediate Regional Hurricane.

y County on Florida's west coast about 100 s north of Tampa (population 12,756) has 50 s of coast with flood plains which extend in as much as 10 miles. The sparsely developed d plain contains residences, businesses, roads a sewage treatment facility in the vicinity of ar Key and Yankeetown. Future development xpected to be limited due to the extensive mps and marshes although both cities are ving. Freshwater floods from intensive rainfall r in the interior area and adjacent to the Sunee River. Hurricanes which cause tidal floodan occur from June to October but are most y in September and October. On 12 occasions e 1920 a hurricane has passed within 50 miles evy County.Five tidal floods have occurred e 1935. High winds and tidal flooding from ricane Agnes in June 1972 caused $750,000 ge. Tides reached 8 ft above mean sea level. s during the Intermediate Regional Tidal d would reach 16.5 and 21 msl, respectively, flood levels decreasing at the rate of about 1 as the flood level moves inland. The IRF d flood 1,000 developed acres and 700 struc. SPF would flood 1,500 developed acres and tructures. The Intermediate Regional Hure would have a central pressure of 27.5 inches naximum winds of 103 mi/hr. The Standard ct Hurricane would have a central pressure .25 inches and maximum winds of 110 mph. ey - North Carolina)

W76-05647

FLOOD PLAIN INFORMATION: LITTLE MCMULLEN CREEK, JESUP, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for the City of Jesup, Georgia. June 1971. 46 p, 30 fig, 21 plates, 13 tab.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flood damage, *Flow characteristics, Storms, Hurricanes, Historic floods, Flood frequency, Peak discharge, Warning systems, Flood stages, Channels, Channel improvement, *Georgia.
Identifiers: Jesup(GA), Little McMullen Creek(GA), Wayne County(GA), Coleman Branch(GA), Millikin Bay(GA), Penholoway Creek(GA), Standard Project Flood, Intermediate Regional Flood.

Little McMullen Creek has two main tributaries, Coleman Branch and Millikin Bay. A tributary of Penholoway Creek, Little McMullen Creek with a drainage area of 23 sq mi has a relatively flat slope and a channel which averages 4 ft in width and is 4 ft deep. Subdivisions are being constructed along and near Little McMullen Creek. Millikin Bay is located in the more highly developed area of Jesup; Coleman Branch flows through a wide, swampy flood plain. It has only a few buildings in the flood plain. Bridges, culverts, sand and silt deposits, and vegetation can obstruct flood flows. Floods can occur at any time of the year as the result of thunderstorms and rainstorms but are most likely to occur in late summer and fall as the result of hurricanes. There have been three major floods since 1898. The Intermediate Regional Flood and the Standard Project Flood would have peak discharges of 3,250 and 8,100 cubic ft/sec respectively at the mouth of Little McMullen Creek. Overbank and channel velocities would reach 1 and 11 ft/sec respectively during IRF, with 26 buildings and 1,057 acres flooded. Water would rise 6 ft in 12 hours and remain above bankfull for 30 hours. SPF would flood 1,407 acres and 62 buildings and would rise 7 ft in 24 hours, remaining above bankfull for 72 hours. (Henley - North Carolina)
W76-05648

CRITERIA FOR EVALUATION OF SOCIAL IMPACTS OF FLOOD MANAGEMENT ALTERNATIVES,
Institute of Public Administration, New York.
For primary bibliographic entry see Field 6B.
W76-05653

WATER'S MOST EFFICIENT SYSTEM.
For primary bibliographic entry see Field 6C.
W76-05655

A RURAL MISSISSIPPI SUCCESS STORY: ALCORN COUNTY'S WATER SYSTEM.
For primary bibliographic entry see Field 6D.
W76-05657

EFFICIENCY IN WATER QUALITY CONTROL FOR THE WILLAMETTE RIVER,
Oregon Univ., Eugene. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05658

PROPOSAL FOR A TRANS-MEDITERRANEAN AQUEDUCT,
Ottawa Univ. (Ontario).
J. G. Debanne.
Technology Review, Vol. 78, No. 1, p 48-55, October-November 1975. 1 fig, 2 tab.

Descriptors: *Water supply, *Water distribution(Applied), *Water resources development, *Electric power, *Aqueducts, Hydraulic structures, Europe, Africa.
Identifiers: France, *Rhone River(France), Algeria, Tunisia, *Trans-Mediterranean Aqueduct.

The increase in oil prices has made it feasible to examine the possibilities and costs of ducting the Rhone River from France to drought-stricken North Africa in exchange for fossil fuels. Three schemes of ducting an average river with flow rates of 20,000 cfs and 40,000 cfs across the Mediterranean are proposed. One proposal includes a 500 mile aqueduct, 150 ft in diameter, made of rubber or rubber-like plastic placed on the sea bottom at a depth of 8400 ft, maintained by cement ballasts. A deep water solution would provide the shortest distance and increase the hydrostatic pressure. The advantages of a shallow water aqueduct, although 300 miles longer, would be greater accessibility, lower costs and lower hydrostatic pressure. The head generated by flow is recoverable at the downstream end and usable as hydraulic energy providing energy savings equivalent to 2000 million barrels of oil. The trans-Mediterranean aqueduct operations could be accompanied by an energy swap whereby France would receive 100 million barrels of oil a year and Algeria and Tunisia would reduce their consumption. Physical constraints such as pressure, sedimentation, buoyancy, sea current, and hydrostatic pressure differential are identified and solutions posed. A cost estimate was made on basis of such materials and power needed to move the water. Construction costs depend on technology available and were calculated using the gas and oil pipeline method. The cost-study deals with a 1400 fathom deep aqueduct. The aqueduct would provide economic benefits, minor ecological costs, reduce political confrontations and help balance payments. (Salzman-North Carolina)
W76-05660

URBAN WATER MANAGEMENT OF AN INTERNATIONAL RIVER: THE CASE OF EL PASO -JUAREZ,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 3D.
W76-05661

FLOOD ROUTING IN CHANNEL SYSTEMS WITH ALLOWANCE FOR BANK REGULATION,
Latvian Scientific Research Inst. of Hydraulic Engineering and Reclamation, Jelgana (USSR).
A. A. Zivert, and V. P. Khelmanis.
Soviet Hydrology, Selected Papers, No. 6, p 560-567, 1973. 4 fig, 17 ref. Translated from Water Resources (Vodnyye resursy), No. 6, p 118-126, 1973.

Descriptors: *Model studies, *Flood routing, *Flood forecasting, Mathematical models, Computer models, Computer programs, Floods, Bank storage, Groundwater, Flood plains, Rivers, Hydrology.
Identifiers: *Tverets River(Latvian SSR), *Latvian SSR, *USSR.

The results of computations of the propagation of the release wave in the Tverets River and practical experience in the use of a mathematical model of the storage type for forecasting the future flood regime of major rivers of the Latvian SSR showed that the proposed simplified method for computing the modification of flood waves in channel systems is applicable under conditions when water exchange between the channel and the flood plain has a significant effect on the flow regime and when the inertial terms of the dynamic equation can be disregarded. Under these conditions, the proposed method has the following advantages: (1) The preparation of morphometric and hydraulic characteristics of river channels from hydrometric and topographic data is simplified. In addition to field observations, hydraulic simulation can be used for channels with complex flood plains and with planned hydraulic installations; (2) Because

the computation method is simplified, it is possible to compute complex branching and linked channel systems without particular mathematical complications; (3) Flood wave modification can be computed with allowance for bank storage. The examined method of simulating floods in channel systems can be recommended for forecasting the future flood regime in relation to the banking and regulation of channels, and the construction of flood-control reservoirs and other hydraulic installations. (Sims-ISWS)
W76-05668

ALLOWANCE FOR PRECIPITATION AND RUNOFF FLUCTUATION PATTERNS IN COMPUTING WATER WITHDRAWAL FOR IRRIGATION SYSTEMS IN THE SOUTHERN UKRAINE,
Ukrainskii Nauchno-Issledovatelsi Gidrometeorologicheski Inst.(USSR).
I. A. Zheleznyak.
Soviet Hydrology, Selected Papers, No. 6, p 504-511, 1973. 2 fig, 6 tab, 11 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 208, p 143-152, 1973.

Descriptors: *Runoff, *Irrigation, *Precipitation(Atmospheric), Water allocation(Policy), Water resources, Water sources, Rivers, River flow, Streamflow, Water level fluctuations, Variability, *Withdrawal, Irrigation practices, Water requirements, Agriculture, Hydrology, Meteorology.
Identifiers: *USSR, *Ukraine.

Because of the continuous increase in water utilization in the southwestern part of European USSR, it has become very important to improve the accuracy of determination of water resources and water withdrawal in the basins of the major rivers of the region: the Danube, Dniester, Southern Bug, Dnieper, and Northern Donets. This can be done not only by determining the various runoff and water utilization characteristics more reliably, but also by allowing for the patterns of fluctuation of hydro-meteorological phenomena. The fluctuations in the runoff of the major rivers of the Ukraine and Moldavia and in precipitation are very asynchronous in irrigation zones. Allowance for this phenomenon in drawing the water-management budget of rivers may significantly reduce the total water withdrawal for irrigation. (Sims-ISWS)
W76-05675

ESTIMATE OF THE EFFECT OF FLOOD-PLAIN DRAINAGE ON THE ANNUAL AND MAXIMUM RUNOFF OF SMALL RIVERS IN THE UKRAINE (DNIEPER BASIN),
G. P. Kubyshkin.
Soviet Hydrology, Selected Papers, No. 6, p 511-517, 1973. 7 tab, 9 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 208, p 213-221, 1973.

Descriptors: *Runoff, *Drainage effects, Rivers, Bogs, Wetlands, Flood plains, Basins, River basins, Drainage, Reclamation, Land use, Agriculture, *Estimating, Forecasting.
Identifiers: *USSR, *Ukraine, *Dnieper River basin(USSR).

The effect of bog drainage on the surface runoff of rivers under reclamation in the Poles'ye and the forest-steppe of the Ukraine (Dnieper basin) can be estimated reliably from a comparison of the runoff of these rivers with that of control rivers over synchronous periods before and after drainage. It is necessary to use several methods of comparison for these two periods after first analyzing the quality of the initial meteorological and hydrologic information. When comparing runoff data before and after drainage, allowance should be made for the nature and magnitude of variations of climatic factors in the drainage basin under study and in control basins, and for the effect of human activity on runoff: artificial regulation, water withdrawal for industrial and domestic needs, agricultural practices in the dry farmed part of the basin, etc. The drainage and agricultural reclamation of the flood-plain bogs of the Ukraine, which are located in the lower or middle parts of basins (without confined groundwater), caused the following decrease in the surface runoff of the small tributaries of the Dnieper (with drainage areas of 200 to 10,000 sq km): a decrease of 20-30% and 30-50% in annual runoff and of 20-40% and 40-60% in maximum runoff in the Poles'ye and the forest-steppe of the Ukraine, respectively. (Sims-ISWS)
W76-05676

WATER AND ITS ROLE IN THE WORLD (WASSER UND WAS ES IN DER WELT DAMIT AUF SICH HAT),
For primary bibliographic entry see Field 6D.
W76-05739

DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Texas Univ. at Austin. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W76-05745

WATER MANAGEMENT CONTROL SYSTEM FOR THE ZAGYVA-TARNA RIVER BASIN,
National Water Authority, Budapest (Hungary).
A. Salamin.
Working Paper No. 21, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 16 p, 3 fig, 3 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water management(Applied), *River basin development, *Control, Hydrology, Meteorology, Data collections, Telemetry, Floods, Planning, Reservoirs, Water demand, Economics, Water pollution control, Timing, Costs, Reliability, Data processing, Runoff, Forecasting.
Identifiers: *Zagyva-Tarna River basin(Hungary), Multiple objective, Information system, Telemechanical data collection, Developing countries.

In the Zagyva-Tarna basin, the flood protection, the fulfillment of the rapidly growing industrial and drinking water demand, and the daily duties of water management supervision and operation all need numerous, reliable and rapid informations. The informations needed are essentially of hydrological and meteorological character; however, the measurement of the parameters of water quality and the knowledge of the operating condition and the remote control of the main regulating structures will be necessary as well. To solve the complex water management tasks on the Zagyva-Tarna basin, the goal is to establish a multiple-purpose information system in which the immediate processing and store of the basic data, collected automatically and quickly by a high grade of accuracy and by suitable density, is assured in the most favorable form from the point of view of access and further detailed processing. It was necessary to time the water management system on the basis of cost and time factors. Phase I includes the telemetry of the data of the most important hydrological and hydrometeorological sensing devices. In Phase II--by means of the gradual realization of the reservoir system--the flow regulation based on telemetry will be achieved. (Bell-Cornell)
W76-05746

REAL-TIME MANAGEMENT OF WATER-RESOURCE SYSTEMS,
Thames Water Authority, Reading (England). Operational Research Unit.
For primary bibliographic entry see Field 6A.
W76-05747

EX-POST EVALUATION OF RIVER BASI DEVELOPMENTS IN PAKISTAN,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W76-05748

THE CZECHOSLOVAK WATER DEVELO MENT PLANNING APPROACH AND ITS A PLICATION,
Ministry of Forest and Water Managemen Prague (Czechoslovakia).
For primary bibliographic entry see Field 6A.
W76-05749

THE COLUMBIA BASIN PROJECT REA PRAISED,
Central Washington State Coll., Ellensburg.
G. Macinko.
Working Paper No. 24, UNDP/UN Interregion Seminar on River Basin and Interbasin Develo ment, Budapest, Hungary, September 1975. 18 p tab, 4 ref. (United Nations, Department Economic and Social Affairs).

Descriptors: *Evaluation, *Irrigation syste *Projects, *Water resources developme Economics, Food abundance, Land use, Agric ture, Farm management, Methodology, Decisi making, *Columbia River.
Identifiers: *Columbia Basin Project, Grand Co lee Dam, Ex-post evaluation.

Examination of the evolution of the Colum Basin Project from its beginnings in the ea 1930's to the present reveals its perceived wo has undergone two major reversals. These cha ing assessments of the project's worth were fluenced by technological developments and broad scale social changes at the national and ternational levels respectively, and were primarily the result of features intrinsic to the p ject itself. In a society subject to social technological change as dynamic and ubiquitous that of modern America, water projects wh development period spans several decades likely to encounter situations difficult or impo ble to foresee at the beginning of the developm effort. Long-range planning is enormously co plicated, and, while the broad outlines of the ture may be sketched in as aid to present planni there apparently is little profit to be gained fr attempting detailed and highly quantified fut projections as the basis for planning efforts. reappraisal of the Columbia Basin Project sugge that the most useful planning technique for b developed and developing nations may well volve deliberate efforts to severely limit decisi making criteria to the most basic fundamentals to make ex-post evaluation an integral part of p ject planning. (Bell-Cornell)
W76-05750

EVALUATION OF THE EFFECTS OF WA TRANSFER,
Research Inst. for Water Resources Developm Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-05751

DECISION MAKING AND PLANNING F RIVER BASIN DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Systems and dustrial Engineering; and Arizona Univ., Tuc Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W76-05752

INTER BASIN TRANSFER OF WA RESOURCE CASE STUDY OF INDUS P JECT,
West Pakistan Water and Power Developm Authority, Lahore.
N. C. Syed.

'orking Paper No. 28, UNDP/UN Interregional eminar on River Basin and Interbasin Develop-ent, Budapest, Hungary, September 1975. 24 p, 2 , 6 tab, 14 ref. (United Nations, Department of conomic and Social Affairs).

escriptors: *River basin development, *Inter-sin transfers, *Water resources, *Projects, His-ry, Costs, Financing, Technology, Environ-nt, Runoff, Annual, *Irrigation, Canals, Water pply, Riparian rights, Treaties, atersheds(Basins).
ntifiers: *Indus Project, Developing countries, kistan, India, Water disputes.

ater has always been an essential component of onomic stability, agricultural efficiency, osperity, and consequent progress of mankind. e to this unique importance, water resources ve always received special priority in engineer-activities. Use of water for irrigated agriculture the Indus Plains dates back to thousands of rs, as this part of the world inherits one of the est civilizations. However, a systematic har-sing of the surface water started in the sub-con-nt around the turn of the nineteenth century. early twentieth century, the critical period ru-f in the Indus System had been almost tapped. wever, competing water demands from various rians started mounting. To cope with this, the gation engineers resorted to the innovative r-river transfer of the water to the extent per-ted by environments. Though some additional emes in this respect were thought of sub-uently, their implementation was considered rimental to the lower water riparians. In 1947, sub-continent was partitioned to create India Pakistan. Being upper riparian, India created a er dispute, which was settled in September 0 through signing of the Indus Water Treaty. implement provisions of the Treaty, Pakistan to construct the Indus Basin Project. cribed is the case study in the context of: (1) oric background; (2) option of interbasin sfer in preference to other alternatives; (3) ex-and scope of the Project; (4) mode of financ-and cost; (5) execution of the Project, includ-necessary institutional and other facilities; and technological, environmental, and other cts of the Project. (Bell-Cornell)
5-05753

HNICAL-ECONOMIC PLANNING OF THE CIKOVO-NAGYMAROS BARRAGE PRO-T FOR THE DEVELOPMENT OF THE CEN-L-DANUBE BASIN,
onal Water Authority, Budapest (Hungary).
agy.
king Paper No. 29, UNDP/UN Interregional inar on River Basin and Interbasin Develop-, Budapest, Hungary, September 1975. 16 p, 1 (United Nations, Department of Economic Social Affairs).

riptors: *River basin development, nning, *Economics, Navigation, Water ly, Management, Methodology, Industries, regulation, Riparian waters, Shipping.
ifiers: Central Danube Basin, Hungary, hoslovakia, International projects, *Barrage cts, Cargo, *Danube River.

the common Czechoslovakian-Hungarian er section of the Danube River, where s are inadequate and consequently ford ings are poor, navigation requirements will isfied after the realization of the Gabcikovo-maros Barrage Project. After the commis-g of the Project, international navigation tions will be comparable in importance to of the Iron Gate Project on the Lower-e. The possibilities of water supply for in-and for the adjacent towns will greatly im-along the affected Danube section. Flood l conditions also will be better. Utilization power potential of the river will become profitable. Along the shores of the reser-voirs, large sporting and recreation areas can be created, and the conditions for irrigation in the two countries will be increasingly favorable. In the course of planning, a general method adaptable to international projects has been derived whereby a division of the total cost into 50-50% between the two countries can be achieved, enabling accurate cost allocation. To ease the complicated task of planning, a 33-step Common bi-lateral planning scheme is suggested. This international project serves not only the aims of the two neighboring countries, but it will influence the development of all European countries. (Bell-Cornell)
W76-05754

SOCIAL IMPACTS OF INTEGRATED RIVER BASIN DEVELOPMENT ON LOCAL POPULATIONS,
California Inst. of Tech., Pasadena. Div. of Humanities and Social Sciences.
For primary bibliographic entry see Field 6A.
W76-05755

INTERNATIONAL MANAGEMENT OF THE RIVER PLATE BASIN,
University of Western Ontario, London. Dept. of Geography.
J. C. Day.
Working Paper No. 31, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 41 p, 9 fig, 4 tab, 53 ref. (United Nations, Department of Economic and Social Affairs)

Descriptors: *River basin development, *Management, Human population, Governments, Coordination, Hydroelectric power, Foreign countries, Industries, Agriculture, Transportation, Discharge(Water).
Identifiers: *Developing countries, *Plate River Basin(South America), International cooperation, Trade.

An integrated river-management experiment was undertaken in 1967 in the Plate Basin. New institutional arrangements were created to direct and coordinate initiatives. While joint efforts have not resulted in cooperative programs, they have permitted diplomats and technicians to meet their counterparts in other nations and to discuss a wide range of matters for the first time, including questions with implications beyond the physical basin. Nevertheless, the most important developments pertaining to hydroelectricity and physical integration are occurring outside the program. In the absence of international agreements to divide the energy potential, Argentina and Brazil adopted conflicting hydroelectric programs in the international reach of the Parana River. Massive national and bilateral water and transport projects are constructed, approved, or being planned. Before the transportation, water resources, and energy transmission integration working groups in the Plate Program finalize their plans, most important physical links between countries and power developments will be completed, aided by international financing. Moreover, there is no international agreement yet on water quality standards, water diversions, and water-use priorities. Ecological and esthetic consequences of developments have largely been ignored. However, choices are narrowed and the potential for international animosity increases with each dam completed in the international canyon of the Parana, or elsewhere, based on bilateral or unilateral decisions.
W76-05756

SIMULATION AS A TOOL IN INTERNATIONAL RIVER DEVELOPMENT,
Karlsrube Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 6A.
W76-05757

INTERNATIONAL RIVER BASIN COOPERATION: SOME FACTORS INFLUENCING AGREEMENT,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 6E.
W76-05758

LEGAL FRAMEWORK OF CO-OPERATION IN THE FIELD OF WATER MANAGEMENT BETWEEN HUNGARY AND HER NEIGHBORING COUNTRIES,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6E.
W76-05759

LONG RANGE PLANNING OF WATER RESOURCES: A MULTI OBJECTIVE APPROACH,
National Water Authority, Budapest (Hungary). Dept. of Water Management Policy.
For primary bibliographic entry see Field 6A.
W76-05760

FLOOD LOSS MANAGEMENT IN DEVELOPING COUNTRIES: A MODEL FOR IDENTIFYING APPROPRIATE STRATEGIES,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6A.
W76-05761

MULTIPURPOSE RIVER PROJECT PLANNING IN THE LOWER MEKONG BASIN: A DECISION APPROACH,
Economic Commission for Asia and the Pacific, Bangkok (Thailand).
For primary bibliographic entry see Field 6A.
W76-05762

WATER RESOURCES DEVELOPMENT IN THE GANGA-GHAGRA INTERBASIN IN UTTAR PRADESH (INDIA),
Central Board of Irrigation and Power, New Delhi (India).
N. C. Saksena.
Working Paper No. 42, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 22 p, 1 fig, 4 tab. (United Nations, Department of Economic and Social Affairs)

Descriptors: *Water resources development, *River basins, *Irrigation programs, Agriculture, History, Economics, Social aspects, Groundwater, Surface waters, Canals, Water utilization, Reservoirs, Diversion, Projects, Water supply, Constraints.
Identifiers: *Uttar Pradish(India), *Developing countries, Economic growth, Artificial irrigation, Social welfare, Socio-economic interaction.

Implementation of irrigation schemes results in social and economic growth. In a region where the majority of the population is engaged in agriculture and where rainfall distribution is not timely, the necessity of artificial means of irrigation increases. In Uttar Pradesh the livelihood of 80% of the people is dependent on agricultural activity. The fertile tract of Ganga-Ghagra interbasin occupies one third of the area. The whole-sale dependence of agriculture on the natural precipitation has been during many years a cause for total failure of crops and famine in the interbasin, bringing the economic condition of the people to near bankruptcy in such years. Although mighty rivers flow in this interbasin, either there are no suitable sites for providing storages or else they cannot be utilized in this region, and so a most attractive proposition is to divert their monsoon water and employ it for paddy cultivation. This paper gives the history of irrigation for the interbasin, including the program and projects for utilization of sur-

face and ground water and their impact on the social and economic growth of the populace. In this interbasin, irrigation by diversion canals, pumped canals, and tubewells have been implemented; the future program is based on past experience. After enforcement of these schemes, it will be possible to feed Uttar Pradesh and to yield surplus food for export, thereby earning the foreign exchange at the turn of the century. An era of progress and prosperity will be ushered in for the region. (Bell-Cornell)
W76-05763

MONETARY VALUES OF LIFE AND HEALTH.
Tennessee Valley Authority, Knoxville. Flood Control Branch.
For primary bibliographic entry see Field 6F.
W76-05812

REGIONAL WATER EXCHANGE FOR DROUGHT ALLEVIATION,
Colorado State Univ., Fort Collins. Hydrology and Water Resources Program.
K. Takeuchi.
Hydrology Papers No. 70, November 1974. 31 p. 6 fig., 3 tab., 16 ref. NSF GK-11564, GK-31521X.

Descriptors: *Water transfer, *Economic feasibility, *Droughts, Water shortage, River basins, Water conveyance, Insurance, Closed conduits, Pressure conduits, Reservoirs, Networks, *Regional analysis.
Identifiers: *Water interchange, Bi-directional conveyance, Drought insurance, Case study.

The physical and socio-economic feasibility of a regional water-exchange concept as an alternative to uni-directional transfer, water storage, water exchange, and drought insurance in alleviating drought problems, are examined. The Federal Crop Insurance Corporation offers insurance against drought hazards, but it is unlikely that a drought insurance program can be expanded to cover anything other than crops on unirrigated lands; however drought insurance for industries and/or municipalities may be realistic. A regional water-exchange system, by using bi-directional water transmission under pressure, can alleviate drought situations by smoothing the regional water surpluses and deficits. Such a network can be established without huge economic investment in large urban areas. By smoothing water supply-water demand imbalances, the need for additional water storage capacities may be significantly reduced and can compensate for the resistance against the construction of large reservoirs. The benefits of an exchange system will accrue to all interconnected regions and thus avoid interregional disputes common in uni-directional water transfers. In order to maximize the substitution effect, the water-exchanage system should be optimally operated by assuming unlimited capacities in the water-exchange lines. The efficiency measure is illustrated by a hypothetical regional water-exchange system which interconnects the Missouri, North and South Platte, Arkansas, Rio Grande, and Colorado Rivers. (Auen-Wisconsin).
W76-05819

BENEFIT AND COST ANALYSIS OF HYDROLOGICAL FORECASTS,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 6B.
W76-05823

AN ECONOMIC ANALYSIS OF WATER USE IN COLORADO'S ECONOMY,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-05837

MULTI-OBJECTIVE WATER RESOURCES PLANNING: METHODOLOGY TO ACHIEVE COMPATIBILITY BETWEEN ENVIRONMENTAL AMENITIES AND ECONOMIC DEVELOPMENT,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 6B.
W76-05840

APPLICATION OF MULTI-REGIONAL PLANNING MODELS TO THE SCHEDULING OF LARGE-SCALE WATER RESOURCE SYSTEMS DEVELOPMENT,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6A.
W76-05846

STEADY-STATE SEGMENTED DISSOLVED-OXYGEN MODEL,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 5B.
W76-05855

THE 1973 MISSISSIPPI RIVER BASIN FLOOD: COMPILATION AND ANALYSES OF METEOROLOGIC, STREAMFLOW, AND SEDIMENT DATA,
National Weather Service, Silver Spring, Md.; and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-05860

SOLUTE TRAVEL-TIME ESTIMATES FOR TILE-DRAINED FIELDS: I. THEORY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-05904

SOLUTE TRAVEL-TIME ESTIMATE FOR TILE-DRAINED FIELDS: II. APPLICATION TO EXPERIMENTAL STUDIES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-05905

DEPENDABLE YIELD OF RESERVOIRS WITH INTERMITTENT INFLOWS,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
W. R. Gwinn, and W. O. Ree.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, p 1085-1088, November-December 1975. 4 fig, 2 tab, 2 ref.

Descriptors: *Reservoir yield, *Rainfall-runoff relationships, *Low flow, *Hydrologic budget, *Reservoir operation, *Oklahoma, Lake stages, Withdrawal, Droughts, Inflow, Runoff, Water yield, Watershed management.
Identifiers: Lake McMurtry(Okla), Black Bear Creek(Okla), Council Creek(Okla).

A precipitation-runoff relationship for drought periods was developed for grasslands of the Reddish Prairies in Oklahoma. Data from five watersheds ranging in size from 0.0676 to 1492 sq km were used in the development. Minimum accumulated runoff was expressed as a function of the related precipitation and watershed size for the driest periods on record, ranging in length from 1 to 10 yr. The precipitation-runoff relationship and the storage equation were used to determine the dependable use rates of water from a reservoir so that the water level would not drop below a preselected minimum. (Lardner - ISWS)
W76-05908

COMMENT UPON MULTIVARI SYNTHETIC HYDROLOGY,
Centro di Ricerca IBM di Pisa (Italy).
For primary bibliographic entry see Field 2A.
W76-05909

CORRECTION OF BIAS IN THE ESTIMAT OF THE COEFFICIENT OF SKEWNESS,
Institut National de la Recherche Scientifi Rimouski (Quebec).
For primary bibliographic entry see Field 2E.
W76-05910

USING PARAMETRIC MODELS OF RUN TO IMPROVE PARAMETER ESTIMATES STOCHASTIC MODELS,
Kentucky Univ., Lexington. Dept. of Agricul Engineering.
For primary bibliographic entry see Field 2E.
W76-05911

DISCHARGE EQUATIONS FOR HS, H, ANI FLUMES,
Agricultural Research Service, Stillwater, C Water Conservation Structures Lab.
For primary bibliographic entry see Field 8B.
W76-05918

CONDITIONAL EXPECTED TSUNAMI I DATION FOR HAWAII,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 8B.
W76-05920

GEOLOGY AND WATER RESOURCES CHARLES MIX AND DOUGLAS COUNT SOUTH DAKOTA, PART I: GEOLOGY,
Geological Survey, Vermillion, S. D.
L. S. Hedges.
Bulletin 22, 1975. 43 p, 23 fig, 2 tab, 42 ref.

Descriptors: *Geologic formations, *Geolog vestigations, *Geologic mapping, *Geohydro units, *South Dakota, Geologic units, Geo time, Aquifers, Glacial drift, Ground resources, Till, Stratigraphy, Tertiary pe Water resources.
Identifiers: Illinoian glaciation, Wiscon glaciation, Cretaceous system, Outwash.

Charles Mix and Douglas Counties include a of about 1,540 sq mi in southeastern South Da The Precambrian Sioux Quartzite underlie area and is overlain by Cretaceous shales, stones, limestones, and marls as much as 1,7 thick. Tertiary rocks of Miocene-Pliocene ag about 150 feet thick and are mapped as Og undifferentiated and the Fort Randall Form Glacial and non-glacial deposits as much as thick mantle the bedrock in the bedrock cha The major bedrock channels were cut b White River after it was diverted from its ch north of the study area. The Wagner Form (new name), a non-glacial western derived f deposit, was deposited by the diverted River. Large reserves of groundwater and su water are available for development. Large and gravel reserves are also present but ac bility presently limits the development o natural resource. Present data indicate no si cant metallic or fossil fuel resources in C Mix and Douglas Counties. (Sanderson-ISWS
W76-05923

COMPARATIVE ESTIMATE OF ENE LOSSES IN BODIES OF WATER, AND Q AND TURBULENT FLOWS,
For primary bibliographic entry see Field 8B.
W76-05924

NOW ACCUMULATION AND MELTING IN HE FOREST AND IN CLEAR-CUT AREAS IN HE CENTRAL URAL,
sesoyuznyi Nauchno-Issledovatelskii Institut esovodstva i Mekhanizatsii Lesnogo Khozyaist-a, Pushkino (USSR).
or primary bibliographic entry see Field 2C.
76-05929

YDRAULIC COMPUTATION OF A POOL OLLOW,
or primary bibliographic entry see Field 2E.
76-05931

APS OF THE ELEMENTS OF THE YDROLOGIC BUDGET OF ASIA,
kademiya Nauk SSSR, Moscow. Institut egrafii.
or primary bibliographic entry see Field 2A.
76-05934

OIL MICROBES,
rest Service (USDA), Corvallis, Oreg. Pacific rthwest Forest and Range Experiment Station.
r primary bibliographic entry see Field 2G.
76-05935

OIL PROCESSES AND INTRODUCED CHEMI-LS,
rest Service (USDA), Corvallis, Oreg. Pacific rthwest Forest and Range Experiment Station.
r primary bibliographic entry see Field 4C.
76-05936

MAND FOR DISSOLVED OXYGEN EX-TED BY FINELY DIVIDED LOGGING BRIS IN STREAMS,
rest Service (USDA), Corvallis, Oreg. Pacific rthwest Forest and Range Experiment Station.
r primary bibliographic entry see Field 4C.
76-05939

OLOGY AND GEOMORPHOLOGY OF THE J. ANDREWS EXPERIMENTAL FOREST, STERN CASCADES, OREGON,
rest Service (USDA), Corvallis, Oreg. Pacific rthwest Forest and Range Experiment Station.
primary bibliographic entry see Field 4D.
6-05941

IBER PRODUCTION AND WATER QUALI-- PROGRESS IN PLANNING FOR THE LL RUN, PORTLAND, OREGON'S MU-IPAL WATERSHED,
est Service (USDA), Corvallis, Oreg. Pacific thwest Forest and Range Experiment Station.
primary bibliographic entry see Field 5B.
6-05942

TICIDE RESIDUE DYNAMICS IN A REST ECOSYSTEM: A COMPARTMENT DEL,
st Service (USDA), Corvallis, Oreg. Pacific thwest Forest and Range Experiment Station.
primary bibliographic entry see Field 5B.
-05946

TER LEVEL GAUGE,
artment of the Navy, Washington, D.C. Office e Secretary.
primary bibliographic entry see Field 7B.
-05977

OD-CAUSED TREE MORTALITY AROUND NOIS RESERVOIRS,
is Univ. at Urbana-Champaign. Dept. of stry.
Bell, and F. L. Johnson.
s Ill State Acad Sci. 67(1): 28-37. 1974.

Descriptors: *Illinois, *Trees, Reservoirs, Floods, Mortality.

The effects of high reservoir levels in Rend Lake and Lake Shelbyville, both located in southern Illinois, on species of the streamside forest are described. Tolerances to growing season inundation for 24 tree species were determined from data on tree elevation and duration of flooding. A limit of 30 days of flooding during spring and summer months is suggested to insure survival of tree vegetation around reservoir margins.--Copyright 1975, Biological Abstracts, Inc.
W76-06027

A NON-ADAPTED VEGETATION INTERFERES WITH WATER REMOVAL IN A TROPICAL RAIN FOREST AREA IN HAWAII,
Hawaii Univ., Honolulu. Dept. of Botany.
D. M. Dombois.
Trop Ecol. 14(1): 1-18. 1973.

Descriptors: Vegetation, *Hawaii, Mulch, Soils, Rain forests, Reforestation, Vegetation establishment.
Identifiers: *Andropogon-Virginicus, *Tropical rain forests, Evergreens.

Water retention by Andropogon virginicus mulch on Hawaii soils was investigated. During the rainy season, the grass cover prevents evaporation sufficient to drain the soil. Reforestation with tropical evergreens is recommended to restore proper balance.--Copyright 1974, Biological Abstracts, Inc.
W76-06042

ILLINOIS DRAINAGE LAW--THE DOMINANT ESTATE OWNER MAY NOT INCREASE THE RATE OR AMOUNT OF SURFACE WATER RUN-OFF ONTO THE SERVIENT ESTATE BEYOND A RANGE CONSISTENT WITH A POLICY OF REASONABLE USE,
P. L. Duke.
Illinois Bar Journal, Vol 63, No. 8, p. 466-469, 475 (1975). 4 p.

Descriptors: *Reasonable use, *Drainage, *Illinois, *Surface runoff, *Diversion, Legal aspects, Civil law, Surface drainage, Drainage effects, Judicial decisions, Drainage water, Damages, Water law, Watershed management, Adjacent land owners.
Identifiers: Servient estate, Dominant estate.

Plaintiff servient estate owner brought an action against defendant dominant estate owners for damages arising out of an allegedly illegal increase in surface water run-off onto the plaintiff's land. The plaintiffs contended that this increase was caused by the subdivision of defendants' land into separate lots, and by the diversion of water from sources other than the natural watershed. At trial, both parties agreed that the civil law rule of drainage was applicable although they differed as to the scope of the rule. The defendants contended that it could not be held liable for an increase in surface run-off unless it could be shown that water was diverted from another watershed. The trial court dismissed the plaintiff's claim for failure to prove such diversion. On appeal, the Illinois Supreme Court saw the issue in the case to be whether the civil law rule encompassed increases in surface run-off or whether it was limited to changes in the normal course of drainage. The court determined that the civil rule applies in cases where the run-off increase is in excess of that allowed by the policy of reasonable use. In so holding, the court considerably narrowed an exception to the rule which had allowed a surface run-off increase if 'good husbandry' reasons could be shown. Consequently, since the run-off increase in this case was found to be unreasonable, the decision was reversed. (Hoffman-Florida)
W76-06051

LEGISLATIVE BARGAIN AND THE DOCTRINE OF REPEAL BY IMPLICATION (DISCUSSION OF CASE INVOLVING COLORADO RIVER STORAGE ACT).
Colorado Law Review, Vol. 46, No. 2, p. 288-310 (1974). 23 p, 1 map.

Descriptors: *National monuments, *Legislation, *Legal review, Colorado River, Water resources development, Legal aspects, Judicial decisions, Federal government, Regulation, Environmental effects, Water law, Water resources, Rivers, Running waters, Bodies of water, Conservation, Water utilization, Water control, Water management(Applied), Economics, Government finance, Budgeting, National parks.
Identifiers: *Colorado River Storage Project Act of 1956, Repeal by implication, Legislative intent.

The United States Tenth Circuit Court of Appeals in the case of Friends of the Earth v. Armstrong held a section of the Colorado River Storage Project Act of 1956 repealed by implication because Congress had consistently refused to allocate funds to realize the project. The court viewed this legislative history as indicating a significant reversal of the congressional position concerning the project. The author's position, however, is that the lack of activity is the result of a bargain struck between environmentalists and committee members in order to obtain passage of the Act. It does not indicate any implicit repeal of the Act but merely the intention of Congress to delay the realization of the project. Furthermore, it is unfortunate that the court expanded the doctrine of repeal by implication abrogating this legislative compromise, since the doctrine should be used only when congressional actions show an unequivocal intent to repeal previously enacted legislation. (Nursey-Florida)
W76-06052

CONGRESS ORDERS MORITORIUM ON GARRISON DIVERSION UNIT.
For primary bibliographic entry see Field 6E.
W76-06054

CERTAIN LAND USE REGULATIONS TO PROTECT FROM DANGER OF FLOODING.
Nags Head Town Council, Nags Head, N.C.
For primary bibliographic entry see Field 6F.
W76-06059

SUGGESTED PROVISIONS TO BE USED IN ZONING ORDINANCES FOR COMPLIANCE WITH SECTIONS 1910.3(C) OF THE NATIONAL FLOOD INSURANCE PROGRAM.
For primary bibliographic entry see Field 6F.
W76-06060

TO AMEND THE WILD AND SCENIC RIVERS ACT (ON S. 10 AND S. 1004).
For primary bibliographic entry see Field 6E.
W76-06081

EVALUATION OF ECONOMIC BENEFITS FOR FLOOD CONTROL AND WATER RESOURCE PLANNING.
Corps of Engineers, Washington, D.C.
Federal Register Vol. 39, No. 159, p. 29539-29550, August 15, 1974. 12 p.

Descriptors: *Cost-benefit analysis, *Adoption of practices, *Administrative agencies, *Flood control, *Economic prediction, Legislation, Economic impact, Evaluation, Measurement, *Planning, Government, Costs, Financial feasibility, Structures, Flood plains, Federal government, Land use, Cost analysis, Water policy, Water resources development.
Identifiers: Administrative guidelines, Department of the Army, Flood Control Act of 1936.

This document sets forth new guidelines issued by the Secretary of the Army, acting through the Corps of Engineers, explaining procedures to be used in evaluating benefits under the national economic development objective for flood control and related water resources planning. Authority for these guidelines stems from the Flood Control Act of 1936 which is directed toward increasing capital and productivity through flood plain management. While there is only one benefit standard, it is applied to three different benefit categories: innundation reduction; intensification; and location. Before any evaluation can be made, however, four preliminary steps must be taken: (1) identification of the affected area; (2) estimation of land use demand; (3) determination of flood plain characteristics; and (4) projection of land use. Sensitivity analysis, utilization of sampling techniques and quantification of variable relationships can further improve the credibility of a flood control plan. The guidelines also require, in addition to the cost-benefit study, reports on the break-even years, internal rate of return, discount rate and value per structure. (Jenkins-Florida)
W76-06083

EURASIAN WATER-MILFOIL IN MICHIGAN,
Auckland Univ. (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 5G.
W76-06149

4B. Groundwater Management

OPTIMAL GROUNDWATER QUALITY MANAGEMENT: WELL INJECTION OF WASTE WATERS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-05507

SIPHON SYSTEM YIELDS CHILEAN PLANT MORE WATER,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8C.
W76-05550

HISTORY OF GROUND WATER CONCEPTS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 2F.
W76-05551

VYREDOX-IN SITU PURIFICATION OF GROUND WATER,
Stockholm Univ. (Sweden). Dept. of Geology.
For primary bibliographic entry see Field 5F.
W76-05553

AQUIFER EVALUATION USING DEPOSITIONAL SYSTEMS: AN EXAMPLE IN NORTH-CENTRAL TEXAS,
Dames and Moore, Boca Raton, Fla.
For primary bibliographic entry see Field 2F.
W76-05554

HISTORY OF GROUND WATER DEVELOPMENT,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol. 30, No. 2, p. 28-29, February 1976.

Descriptors: *History, *Artesian wells, Legislation, *Water wells, *Groundwater mining, *Drilling, United States, Regulation, Construction, Standards, Government supports.
Identifiers: Ancient water wells, Kanats, Water well construction regulations.

The development of ground water removal techniques is discussed. The examples of Jacob's and Joseph's wells are taken from the twenty-sixth chapter of Genesis. The ancient Persian Kanats are explained and their construction methods outlined. Modern water well drilling techniques are reviewed. The need for standardized regulations governing water well construction in the United States is discussed. (Heiss-NWWA)
W76-05556

JUDGING THE AVAILABILITY OF GROUND WATER.
The Johnson Drillers Journal, Vol. 47, No. 6, p 4-9, November-December 1975, 4 fig.

Descriptors: *Groundwater mining, *Groundwater resources, Evaluation, Resource allocation, Water quality, Legal aspects, Dewatering, *Groundwater availability, Water conservation, Water policy.
Identifiers: Groundwater legal aspects, Groundwater level decline, Sustained yield concept.

Long term public policy in the area of ground water conservation must be tempered with specific guidelines before adoption. The meaning of ground water conservation and the methods to implement the program must first be decided upon. Policy must be tailored for three generalized modes of occurrence when dealing with ground water resources: water-table aquifers, coastal plain aquifers and artesian aquifers. The concept of optimal development must be used to specifically treat each of the above modes so as to remain consistent with sound values in resource conservation. (Heiss-NWWA)
W76-05558

COLORADO CITY SOLVES ITS SAND PUMPING PROBLEMS,
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 8C.
W76-05559

CAREFUL SAMPLE TAKING IS KEY TO SUCCESSFUL WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
J. R. Carr.
The Johnson Drillers Journal, Vol. 47, No. 2, p 4-7, March-April 1975, 2 fig.

Descriptors: *Logging(Recording), *Drillers logs, Drill holes, Heaving, *Drilling samples, Boreholes, Wells, Drilling fluids, *On-site data collections.
Identifiers: *Borehole fluid behavior, *Borehole shavings, Sand pump constant sampling techniques.

Close attention to sample retrieval and accurate logging of samples are discussed. Good well driller samples brought up from the borehole are the best means of quality control while drilling a production well. Borehole heaving, the merits and disadvantages of various drilling fluids, and new equipment available to the drilling contractor also are discussed. (Heiss-NWWA)
W76-05560

A DRILLER'S GOOD FRIEND - THE ELECTRIC LOGGER,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8G.
W76-05561

EFFICIENT WELLS SAVE ENERGY AND REDUCE COSTS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
R. L. Schreurs.
The Johnson Driller's Journal, Vol. 47, No. 3, p. 1-3, May-June 1975, 2 fig.

Descriptors: Aquifers, *Storage coefficie
*Drawdown, *Water wells, Co
*Transmissivity, *Operating costs, Energy, C
comparisons.
Identifiers: *Energy conservation, Water
operating costs, Water well design.

Efficient water well design and developm
based on knowledge of hydrologic conditions
much to conserve energy and reduce long t
well costs. The terms transmissivity, coefficien
storage and drawdown are defined and used in
examples of well efficiency. Through these ex
ples the cost effectiveness of a properly develo
water well versus the poorly developed on
demonstrated. (Heiss-NWWA)
W76-05563

PROPER SELECTION OF GRAVEL PACK KEY TO SUCCESSFUL WELLS,
Universal Oil Products, St. Paul, Minn. John
Div.
For primary bibliographic entry see Field 8C.
W76-05565

YUKON CITY'S NEW WELL REPLACES F OLDER ONES,
Hydrogeological Consultants Ltd., Edmo
(Alberta).
R. J. Clissold.
The Johnson Driller's Journal, Vol. 47, No. 3,
5, May-June 1975, 3 fig.

Descriptors: *Municipal water, Water sup
Water wells, Groundwater, *Canada, Drill ho
Aquifer characteristics, *Water yield impr
ment.
Identifiers: *Groundwater temperature, Hea
river water, *Energy cost reduction.

Due to increased water consumption and pro
tive costs of heating river water, the City
Whitehorse drilled five warm water wells betw
1955 and 1973. The yield from the five wells (
imperial gallons per minute) was not sufficien
projected needs. A sixth well was drilled u
results from previous aquifer tests and infra
photographs. A pilot hole was drilled and case
as to allow the collection of lithologic sample
provide data for estimates of aquifer paramc
and information for ground water temperat
The production well utilized a 16 inch surface
ing to 63 feet, 6 feet of 14 inch casing with a
packer and 20 feet of 200-slot 16 inch telesc
screen. The warm water requirement of 2,700
perial gallons per minute for Whitehorse is
met by a single source. It has resulted in a sav
of $1,124,000 annually due to the shutdown o
original five wells and cessation of river w
heating. (Heiss-NWWA)
W76-05566

GROUND WATER IS THE ONLY R RESERVE THIS COUNTRY HAS.
The Johnson Driller's Journal, Vol. 46, No. 6,
4, November-December 1974, 1 fig.

Descriptors: *Water distribution, *Groundw
recharge, *Water sources, Hydrologic buc
Water circulation, Water supply, *United St
*Groundwater resources, *Groundwater av
bility.
Identifiers: Geographic distribution(Water).

The distribution of water on the geosphere of e
is discussed; fresh and salt water volumes are
proximated and distribution is described in te
of hemispherical geography. Non-saline w
sources are quantified and qualified as to thei
cessibility. Annual natural recharge of gro
water in the United States is contrasted agains
cumulative recharge of the past 160 years. Fu
ground water study and development
discussed. (Heiss-NWWA)
W76-05567

ERDA'S TIGER LAGOON PROGRAM TO PROBE NEW ENERGY SOURCE.
For primary bibliographic entry see Field 8A.
W76-05568

EXPERIMENTAL WELL FIELD IS PUT TO MANY USES,
For primary bibliographic entry see Field 8G.
W76-05569

COSTS AS A GUIDE TO PRICING,
Sydney Univ. (Australia). Dept. of Accounting.
For primary bibliographic entry see Field 6C.
W76-05570

EXAMINATION AND REMOVAL OF IRON IN GROUNDWATER,
Tunnittelukeskus-MKR, Helsinki (Finland).
For primary bibliographic entry see Field 5B.
W76-05571

UBSURFACE DISPOSAL OF LIQUID INDUS-RIAL WASTES,
epartment of the Environment, Ottawa Ontario). Inland Waters Directorate.
or primary bibliographic entry see Field 5B.
776-05573

OW STEAM IS PRODUCED AND HANDLED T THE GEYSERS,
or primary bibliographic entry see Field 8C.
776-05574

LASSIFICATION OF METHODS OF ROUNDWATER MANAGEMENT KLASSIFICAKSIIYA METODOV PRAVLENIYA REZHIMOM I RESURSAMI ODZEMNYKH VOD),
. M. Akhmedsafin, and F. V. Shestakov.
estnik Akademii Nauk Kazakhskoy SSR, No. 7, 3-13, 1975. 3 tab, 17 ref.

escriptors: *Groundwater, *Water manage-ent(Applied), *Siphons, *Water supply, echarge, Water table, Pressure, Water resources velopment, Hydrology, *Artificial recharge, ater yield improvement.
entifiers: Groundwater management.

assification is presented of different methods of oundwater management. Forced or siphon type oundwater capture is widely used for water pply, while the use of explosive or nuclear ener- to increase the hydrostatic pressure is in an ex-imental stage. Artificial recharge is used com-nly for water supply in areas with limited water ources. The water table is lowered for ameliora-e purpose, to make the extraction of minerals sible, or to prevent the intrusion of sea-water. oundwater can be displaced to more favorable s by pressure in air or gases. (Takacs-FIRL)
6-05600

RECASTING WATER LEVELS IN UIFERS BY NUMERICAL AND MIHYBRID METHODS,
hnion-Israel Inst. of Tech., Haifa. Dept. of il Engineering.
primary bibliographic entry see Field 2F.
5-05686

VEMENT OF TRACERS THROUGH SOIL,
ario Ministry of the Environment, Toronto. lied Science Section.
primary bibliographic entry see Field 5B.
-05701

DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Texas Univ. at Austin. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W76-05745

REVERSE OSMOSIS PLANT HELPS CITY COPE WITH DIMINISHING GROUNDWATER SUPPLY,
Dacy (G. H.) Associates, Inc., Miami, Fla.
For primary bibliographic entry see Field 5F.
W76-05779

WATER FACTORY 21 IS THE FUTURE,
Toups Corp., Santa Ana, Calif.
For primary bibliographic entry see Field 5F.
W76-05782

NITRATE REMOVAL FROM WATER BY ION EXCHANGE,
Water Research Centre, Medmenham (England). Medmenham Lab.
For primary bibliographic entry see Field 5F.
W76-05806

VERTICAL ELECTRICAL RESISTIVITY SOUNDINGS TO LOCATE GROUND WATER RESOURCES: A FEASIBILITY STUDY,
Old Dominion Univ., Norfolk, Va. Dept. of Geophysical Sciences.
A. Sabet.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 393, $4.50 in paper copy, $2.25 in microfiche. Virginia Water Resource Research Center, Blacksburg, WRRC Bulletin 73, November, 1975. 64 p, 12 fig, 21 ref.

Descriptors: *Groundwater, *Virginia, *North Carolina, *Coastal plains, *Resistivity, *Feasibility studies, Computer programs, Data collections, Data processing.
Identifiers: Virginia Coastal Plain, *Schlumberger array, Electric basement, North Carolina Coastal Plain, Vertical Resistivity.

The occurrence of ground water in the Coastal Plain region of southeastern Virginia and northeastern North Carolina, as indicated by the results of 45 vertical resistivity soundings (VES), is discussed. Soundings were taken with the Schlumberger array with a maximum separation of 8,000 feet between the current electrodes. VES data interpreted through an automatic computer interpretation program, and by the curve-matching method. The results suggest that, in the area west of the town of Suffolk, the depth to the basement complex can be determined with reasonable confidence. Eastwards from Suffolk, and 'electric basement' of high resistivity was detected at depths which usually exceeded 1,000 feet. The correlation between some VES interpretation and resistivity logs of wells in their vicinities reveals high degrees of similarities.
W76-05835

INSTITUTIONAL CONSTRAINTS AND CONJUNCTIVE MANAGEMENT OF WATER RESOURCES IN WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W76-05842

APPLICATION OF MULTI-REGIONAL PLANNING MODELS TO THE SCHEDULING OF LARGE-SCALE WATER RESOURCE SYSTEMS DEVELOPMENT,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6A.
W76-05846

A DIGITAL-COMPUTER MODEL FOR ESTIMATING HYDROLOGIC CHANGES IN THE AQUIFER SYSTEM IN DANE COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 2F.
W76-05851

EVALUATION OF DATA AVAILABILITY AND EXAMPLES OF MODELING FOR GROUNDWATER MANAGEMENT ON CAPE COD, MASSACHUSETTS,
Geological Survey, Boston, Mass.
A. W. Burns, M. H. Frimpter, and R. E. Willey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-248 848, $4.00 in paper copy, $2.25 in microfiche. Water-Resources Investigations 16-75, 1975. 22 p, 7 fig, 63 ref.

Descriptors: *Groundwater resources, *Saline water-freshwater interfaces, *Computer models, *Hydrologic systems, *Massachusetts, Hydrologic cycle, Groundwater movement, Water supply, Withdrawal, Groundwater recharge, Specific yield, Aquifer characteristics.
Identifiers: *Cape Cod(Mass).

Groundwater is the major source of water for public and private supplies on Cape Cod, Massachusetts. A peninsula in the Atlantic Ocean, Cape Cod is underlain by unconsolidated earth materials that contain a lenslike reservoir of fresh water 'floating' on salty groundwater. Areal and cross sectional computer simulation models based on solutions to the groundwater flow equation demonstrate the interdependence of water-table altitude, recharge, withdrawal, spatial variations and anisotropy of hydraulic conductivity, spatial variations of specific yield, position of the freshwater/salt-water zone of diffusion, and other boundaries. Currently available (1974) descriptions of these parameters, however, are insufficient to calibrate the models to adequately predict future hydrologic conditions for resource planning and management. (Woodard-USGS)
W76-05856

FLORIDAN AQUIFER IN NORTHEAST FLORIDA--THREE MAPS--HARDNESS OF WATER, CHLORIDE CONCENTRATION, AND POTENTIOMETRIC SURFACE, MAY 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-05859

GEOHYDROLOGY OF THE EVANGELINE AND JASPER AQUIFERS OF SOUTHWESTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 2F.
W76-05861

AVAILABILITY OF GROUND WATER IN THE ANDROSCOGGIN RIVER BASIN, NORTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N.H.
For primary bibliographic entry see Field 7C.
W76-05862

COMPILATION OF METHODOLOGY USED FOR MEASURING POLLUTION PARAMETERS OF SANITARY LANDFILL LEACHATE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-05869

PUMPING-TEST ANALYSIS USING A DISCRETE TIME-DISCRETE SPACE NUMERICAL METHOD,
Birmingham Univ. (England). Dept. of Civil Engineering.

K. R. Rushton, and S. J. Booth.
Journal of Hydrology, Vol. 28, No. 1, p 13-27, January 1976. 11 fig, 3 tab, 10 ref.

Descriptors: *Groundwater, *Pumping, *Numerical analysis, *Aquifer characteristics, Wells, Computer models, Drawdown, Aquifer testing, Sand aquifers, Head loss, Resistance networks, Unsteady flow, Computers, Water wells, Turbulence.
Identifiers: *Step drawdown tests, Well loss, Radial flow model, Dewatering losses.

The application of a digital computer model of radial flow in an aquifer to the estimation of aquifer parameters was considered. Pumping-test data for a shallow unconfined gravel aquifer, in which the drawdown recorded at the pumped well is a significant proportion of the thickness of the aquifer, were used to test the method. The model was sufficiently flexible to allow for decrease in the saturated thickness, vertical components of flow, well losses and variations of aquifer parameters in time and space. (Prickett-ISWS)
W76-05913

GROUNDWATER STUDY OF A VOLCANIC AREA NEAR BANDUNG, JAVA, INDONESIA,
Cowiconsult Ltd., Copenhagen (Denmark).
B. Pulawski, and H. Obro.
Journal of Hydrology, Vol. 28, No. 1, p 53-72, January 1976. 13 fig, 3 tab, 13 ref.

Descriptors: *Groundwater resources, *Areal hydrogeology, *Groundwater availability, *Hydrologic budget, Water resources development, Aquifer management, Groundwater basins, *Water supply, Geohydrologic units, Transmissivity, Hydraulic conductivity, Springs, Water quality, Wells, *Feasibility study.
Identifiers: *Indonesia, *Java, Volcanic terrain, Resistivity survey.

A hydrogeological investigation of the Bandung area, Java, Indonesia, was described. The investigation was carried out as part of a feasibility study directed towards improvement and development of the city's water supply. The area is situated in a tropic mountainous region, dominated by pyroclastic volcanic deposits and with abundant rainfall. The main activities of the investigation were compilation and evaluation of existing climatological and hydrogeological data, testing of four existing wells, a geo-electrical survey, drilling and testing of a new test well, study of water quality by analysis of samples from both springs and wells, and measurements of spring yields. A summary of these data was given in the conclusions. The results of the investigation indicated presence of large groundwater resources within a distance of 15-20 km from the city. The feasibility study recommended that Bandung's water supply be based on these groundwater resources, and this recommendation is being implemented. (Prickett-ISWS)
W76-05914

GEOLOGY AND WATER RESOURCES OF CHARLES MIX AND DOUGLAS COUNTIES, SOUTH DAKOTA, PART I: GEOLOGY,
Geological Survey, Vermillion, S. D.
For primary bibliographic entry see Field 4A.
W76-05923

EXPLOITATION OF THE WATERS OF SUB-PERMAFROST ARTESIAN BASINS,
For primary bibliographic entry see Field 3B.
W76-05930

PORTABLE WATER SAMPLING APPARATUS,
Universal Oil Products Co., Des Plaines, Ill. (Assignee).
For primary bibliographic entry see Field 7B.
W76-05958

EFFECT OF DEPTH AND SALINITY OF GROUND WATER ON EVAPORATION AND SOIL SALINIZATION,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2D.
W76-06036

NORTHERN GREAT PLAINS RESOURCE PROGRAM.
Northern Great Plains Resources Program, Denver, Colo.
For primary bibliographic entry see Field 6D.
W76-06050

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF FOREST FERTILIZATION ON TWO SOUTHEAST ALASKA STREAMS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5C.
W76-05612

IMPACT OF CLEAR-CUTTING AND ROAD CONSTRUCTION ON SOIL EROSION BY LANDSLIDES IN THE WESTERN CASCADE RANGE, OREGON,
Oregon Univ., Eugene. Dept. of Geology.
F. J. Swanson, and C. T. Dyrness.
Geology, Vol 3, No 7, p 393-396, 1975. 1 fig, 1 tab, 16 ref.

Descriptors: *Road construction, *Clear-cutting, *Slope stability, *Soil erosion, *Landslides, Forest management, *Oregon.

The H. J. Andrews Experimental Forest can be divided into two zones of approximately equal area, each with strikingly different susceptibilities to erosion by rapid soil movements. A stable zone occurs at elevations above 900 to 1,000 m in terrain underlain by lava-flow bed rock. Since logging and road cutting began in 1950, only two small road-related slides have taken place in the stable zone. In contrast, the unstable zone, located at elevations below 1,000 m and underlain by altered volcaniclastic rock, has been the site of 139 slides during the same period. Slide erosion from clear-cut areas in the unstable zone has totaled 6,030 m3/km2, or 2.8 times the level of activity in forested areas of the unstable zone. Along road rights-of-way, slide erosion has been 30 times greater than on forested sites in the unstable zone; however, only about 8 percent of a typical area of deforested land in the unstable zone is in road right-of-way. At comparable levels of development (8 percent roads, 92 percent clear-cut), road right-of-way and clear-cut areas contribute about equally to the total impact of management activity on erosion by landslides in the unstable zone. The combined management impacts in the unstable zone (assuming 8 percent road right-of-way and 92 percent clear-cut) appear to have increased slide activity on road and clear-cut sites by about 5 times relative to forested areas over a period of about 20 years. (Forest Service)
W76-05614

PINE MANAGEMENT INFLUENCES THE SOUTHERN WATER RESOURCE,
Forest Service (USDA). Southern Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05616

THE IMPACT OF TIMBER HARVEST, FERTILIZATION, AND HERBICIDE TREATMENT ON STREAMWATER QUALITY IN WESTER OREGON AND WASHINGTON,
Forest Service (USDA), Corvallis, Oreg. Pacif Northwest Forest and Range Experiment Station
For primary bibliographic entry see Field 5B.
W76-05618

LIMNOLOGICAL DATA FOR THE MAJO STREAMS IN CHESTER COUNTY, PENNSY VANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-05852

SEDIMENT CHARACTERISTICS OF FI STREAMS NEAR HARRISBURG, PENNSY VANIA, BEFORE HIGHWAY CONSTRUCTIO
Geological Survey, Harrisburg, Pa.
L. A. Reed.
Available from Supt. of Documents, GPO, Was D.C. 20402, Price $0.65. Water-Supply Paper 17 M, 1976. 29 p, 24 fig, 1 tab, 6 ref.

Descriptors: *Sediment transport, *Road co struction, *Farm ponds, *Small watershe *Pennsylvania, Sedimentation, Rainfall-run relationships, Streamflow, Turbidity, Erosi control, Basic data collections, Planning.
Identifiers: *Enola(Pa).

Rainfall, streamflow, sediment, and turbidity d are presented as part of a study to evaluate the fects of highway construction on sedim discharge and for determining the effectiveness different erosion-control measures in reduc sediment discharges. The study area, near Eno Pa., consists of five adjacent drainage basins, f of which will be crossed by Interstate 81. Nin percent of the land in each of the basins is in for or grass. Active farmland accounts for less than percent, and the remainder is in roadways a buildings. The major factor affecting sedim concentrations and discharges was the constr tion of a one-lane roadway and a 5-acre farm po Approximately 100 tons of sediment discharged by the stream as a result of the ro way and pond construction. (Woodard-USGS)
W76-05854

HYDROLOGIC ASPECTS OF URBANIZATIO
V. V. Kupriyanov.
Soviet Hydrology, Selected Papers, No. 5, p 4 412, 1973. 4 fig, 3 tab, 14 ref. Translated fr Transactions of the State Hydrologic Instit (Trudy Gossudarstvennogo Gidrologicheskogo stituta), No. 2-6, p 122-133, 1973.

Descriptors: *Urbanization, *Hydrologic aspe *Urban runoff, Land use, Human population, ties, Urban hydrology, Urban drainage, Run Weather, Discharge(Water), Low flow, S ments, Water quality, Hydrology.

The changes introduced by human activity most clearly reflected in the runoff and w quality of urbanized areas. The effect of cities the bodies of water of the surrounding area determined, first of all, by the ratio of the area cupied by a city to the drainage area. If the a occupied by large modern cities of 100 sq km more are considered, it is natural that their ef on the qualitative and quantitative regime bodies of water and groundwater will spread relatively large drainage basins. This refers ticularly to water quality. Study of the hydrol of cities, where most of the population and ma al assets are concentrated, becomes particul important because drastic changes in the la scape are introduced there that disturb the nat relations between the elements of the hydrol budget. These changes may lead to catastro consequences with improper construction poor water-management organization. (S ISWS)
W76-05925

FFECT OF URBANIZATION ON THE QUALI-
Y OF RIVER WATER,
or primary bibliographic entry see Field 5B.
V76-05926

LOPE RUNOFF AND ITS CHANGE UNDER
HE EFFECT OF AGRICULTURAL AND
OREST IMPROVEMENT PRACTICES,
. Ye. Vodogretskiy, E. A. Zaytseva, and L. V.
efimova.
oviet Hydrology, Selected Papers, No. 5, p 421-
44, 1973. 7 fig, 16 tab, 15 ref. Translated from
rudy Gossudarstvennogo Gidrologicheskogo In-
ituta, No. 206, p 172-207, 1973.

escriptors: *Runoff, *Slopes, *Forests,
Agricultural watersheds, Forest watersheds,
Vatersheds(Basins), Farm management, Forest
anagement, Soils, Rainfall-runoff relationships,
egetation establishment, Vegetation effects,
gricultural runoff, Forestry, Hydrology.
lentifiers: *USSR.

he method developed for estimating the effect of
gricultural practices on slope runoff, based on an
nalysis of the relation between the runoff coeffi-
ent and the moisture reserves in the soil, its
eezability, and slope steepness, refined the exist-
g recommendations. The method made it possi-
le to roughly estimate the effect of agricultural
ractices with allowance for differences in soils
nd slope steepness for two zones of the European
SSR and the steppe regions of Northern Kazakh-
an. Failure to allow fully for the soils and slopes
f fields can lead to substantial errors and mainly
an overestimation of the change in slope runoff
y a factor of 1.5-2. (Sims-ISWS)
76-05927

NOW ACCUMULATION AND MELTING IN
HE FOREST AND IN CLEAR-CUT AREAS IN
HE CENTRAL URAL,
sesoyuznyi Nauchno-Issledovatelskii Institut
esovodstva i Mekhanizatsii Lesnogo Khozyaist-
a, Pushkino (USSR).
or primary bibliographic entry see Field 2C.
76-05929

OIL PROCESSES AND INTRODUCED CHEMI-
ALS,
orest Service (USDA), Corvallis, Oreg. Pacific
orthwest Forest and Range Experiment Station.
. G. Moore, and L. A. Norris.
or sale by the Superintendent of Documents,
.S. Government Printing Office, Washington,
.C. 20402. In: Environmental Effects of Forest
esidues Management in the Pacific Northwest.
tate of Knowledge Compendium. USDA Forest
ervice Technical Report, PNW-24, p. C-1 to C-
. 1974. 1 fig, 5 tab, 69 ref.

escriptors: Fertilizers, Pesticides, Cycling
utrients, Soil formation, *Soil chemical proper-
es, Forest management, Clear-cutting, Lumber-
g, Burning, *Soil treatment.
entifiers: Fire retardants.

orest residue management is not likely to have a
ort-term influence on soil formation unless sig-
ficant surface erosion or soil mass movements
cur. Long-term changes in the rate and direction
soil formation may result from intensified
anagement practices including residue treat-
ent. Clearcutting and severe burning temporarily
terrupt or reduce nutrient cycling, but normal
cling is restored as revegetation occurs. All
pes of burning result in loss of some nitrogen.
vailability of other nutrients is increased tem-
orarily after burning, and some recovery of
trogen may occur through increased nitrogen fix-
ion. Mechanical treatment and spreading of
sidues increase the rate of both residue decom-
sition and nutrient release, but availability of
tive nitrogen may become limiting and the addi-
n of fertilizer nitrogen necessary. Fertilizer and fire retardant chemicals increase the nutrient content of residues and may influence the selection of residue treatment methods. (Forest Service)
W76-05936

SOIL STABILITY AND WATER YIELD AND QUALITY,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-05937

EFFECTS OF FOREST FERTILIZATION WITH UREA ON STREAM WATER QUALITY--QUILCENE RANGER DISTRICT, WASHINGTON,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05938

DEMAND FOR DISSOLVED OXYGEN EXERTED BY FINELY DIVIDED LOGGING DEBRIS IN STREAMS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
S. L. Ponce, and G. Brown.
Forest Research Laboratory, School of Forestry, Oregon State University, Res. Pap. 19, October, 1974. 10 p, 4 fig, 3 tab, 4 ref.

Descriptors: *Wood wastes, *Toxicity, *Organic matter, *Biochemical oxygen demand, Water sampling, Forest management, Water pollution sources, Fish toxins, *Dissolved oxygen, Leaves.
Identifiers: Needles.

The impact of Douglas fir needles and twigs, western hemlock needles, and red alder leaves on dissolved oxygen and thus on the quality of mountain stream water was examined. The mean COD, 90-day BOD, and BOD rate coefficients were, respectively, 454 mg 02/g, 110 mg 02/g, and 0.125 for Douglas fir needles, 947 mg 02/g, 110 mg 02/g, and 0.056 for Douglas fir twigs, 570 mg 02/g, 200 mg 02/g, and 0.049 for western hemlock needles, and 882 mg 02/g, 286 mg 02/g, and 0.047 for red alder leaves. The 90-day values of BOD and K1 could be estimated accurately by tests of 20, 20, and 60 days, respectively, for Douglas fir needles, western hemlock needles, and red alder leaves. Fluctuating temperature exerted a 5-day BOD 4.0, 2.4, and 4.2 times greater than the standard temperature BOD5 for Douglas fir needles, western hemlock needles, and red alder leaves, respectively. Toxicity of a leachate extracted from each species was determined on guppies and steelhead trout fry. The concentration of material needed to produce toxic effects was very high, so high, in fact, that oxygen depletion probably would be responsible for death long before the leachate effect. Data on oxygen depletion obtaind in this study will be useful in developing a predictive model for water quality management on forested lands. (Forest Service)
W76-05939

IMPACT OF FOREST FERTILIZATION ON WATER QUALITY IN THE DOUGLAS-FIR REGION -- A SUMMARY OF MONITORING STUDIES,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05943

SLOPE STABILITY PROBLEMS ASSOCIATED WITH TIMBER HARVESTING IN MOUNTAINOUS REGIONS OF THE WESTERN UNITED STATES,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
D. N. Swanston.
General Technical Report PNW-21, 1974. 14 p. 9 fig, 15 ref.

Descriptors: *Soil stability, *Soil erosion, Debris avalanches, Creep, Landslides, Mass wasting, Forest management, Mountain forests, *Lumbering.
Identifiers: Western U.S., Soil mass movement.

Natural soil-mass-movements on forested slopes in the Western United States can be divided into two major groups of closely related landslide types. These include, in order of decreasing importance and regional frequency of occurrence (1) debris slides, debris avalanches, debris flows, and debris torrents; and (2) creep, slumps, and earth flows. Each type requires the presence of steep slopes, frequently in excess of the angle of soil stability. All characteristically occur under high soil moisture conditions and usually develop or are accelerated during periods of abnormally high rainfall. Further, all are encouraged or accelerated by destruction of the natural mechanical support on the slopes. (Forest Service)
W76-05944

HARVESTING SOUTHERN FORESTS: A THREAT TO WATER QUALITY,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05945

ROAD STANDARDS ON STEEP TERRAIN IN THE PACIFIC NORTHWEST U.S.A. WITH SUGGESTIONS FOR IMPLEMENTATION,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
D. N. Swanston.
In: New Requirements in Forest Road Construction (FP2406). Proceedings of symposium sponsored by Association of B.C. Professional Foresters and University of British Columbia, Dec. 9-11, 1974. Vancouver, B.C. p. 137-146.

Descriptors: *Road design, *Design standards, *Road construction, Maintenance, *Oregon, Standards, Pacific Northwest U.S., Erosion control.

A summary of road design, construction and maintenance standards used by the U.S. Forest Service and the State of Oregon in implementation of their Forestry Practices Act is presented with suggestions for effective implementation. (Forest Service)
W76-05948

DICAMBA RESIDUES IN STREAMS AFTER FOREST SPRAYING,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05949

THE FOREST ECOSYSTEM OF SOUTHEAST ALASKA 5. SOIL MASS MOVEMENT,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-05950

4D. Watershed Protection

IMPACT OF CLEAR-CUTTING AND ROAD CONSTRUCTION ON SOIL EROSION BY LANDSLIDES IN THE WESTERN CASCADE RANGE, OREGON,
Oregon Univ., Eugene. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W76-05614

RESERVOIR SEDIMENTATION ASSOCIATED WITH CATCHMENT ATTRIBUTES, LAND-

SLIDE POTENTIAL, GEOLOGIC FAULTS, AND SOIL CHARACTERISTICS,
Forest Service (USDA), Berkeley, Calif., Pacific Southwest Forest and Range Experiment Station.
H. W. Anderson.
In: Proc. Third Federal Inter-agency Sedimentation Conference, Denver, Colorado March 22-25, 1976. Symposium 1.--Sediment Yield and Sources. Water Resources Council p 35-46, 1976.

Descriptors: *Erosion, *Deposition, *Bedload, *Sedimentation, Landslides, Geologic faults, Soil physical characteristics, Snow, Geology, Streamflow, Forest fires, Roads, Highways, Reservoirs, Watershed management, Geomorphology, Elevation, Slope, Forests, Brushlands, Flood frequency.
Identifiers: *Rural roads, *Mountain roads, *Grazing, *Trap efficiency(Reservoirs), Watershed shape, Channel slope, Climatic stress, Sediment sources.

Deposition measurements in 48 northern California reservoirs were found related to precipitation amount, rain-snow frequency, road standards and location, forest fires, geology, and physiography, and also to differences among watersheds (catchments) in landslide classes, extent of geologic faults, clay content of watershed soils, and density of reservoir sedimentation. The data were analysed by reduced rank principal component techniques. The final regression equation had an explained variance of 0.86 and a standard error of 0.138 log units. Difference in average annual deposition associated with reservoir density was 39 percent; with landslides, 100 percent; with faults, 41 percent; and with clay in watershed soils, 32 percent. Some geologic rock types with geologic faults and high landslide potential had a predicted sediment rate as much as 17 times that of areas without faults. Roads located near streams contributed the most to deposition--twice as much as did roads located elsewhere. And improved secondary roads near streams were the single greatest contributor, especially in areas of steep terrain. Roads in steep topography produce twice as much acceleration in sedimentation as do those in less steep terrain. Preliminary appraisal of bedload (difference between reservoir deposition and suspended sediment discharge) indicate it varies from 90 percent to less than 20 percent of 'total load' in different areas. (Forest Service)
W76-05617

THE IMPACT OF TIMBER HARVEST, FERTILIZATION, AND HERBICIDE TREATMENT ON STREAMWATER QUALITY IN WESTERN OREGON AND WASHINGTON,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05618

NUTRIENT CYCLING IN 37- AND 450-YEAR-OLD DOUGLAS-FIR ECOSYSTEMS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05619

THE HYDROLOGIC POTENTIAL OF UNIT AREAS: A BASIS FOR MANAGING WATER RESOURCES,
Forest Service (USDA), Berkeley, Calif., Pacific Southwest Forest and Range Experiment Station.
H. W. Anderson.
In: Proceedings Second World Congress on Water Resources, International Water Resources Association, New Delhi, India, December 1975, Volume IV, p 61-69, 1975. 18 ref.

Descriptors: *Streamflow, *Natural flow, *Average flow, *Flood frequency, *Evapotranspiration, *Precipitation(Atmospheric), Snowfall, Rainfall-runoff relations, *Watershed management, Vegetation effects, Forest fires, Geology, Topography, Analytical techniques, Regression analysis, Methodology, *California.

In deciding how to manage an area for water, the water resources manager needs to know what the land produces, or could be made to produce, in water, floods, or sediment yield. This hydrologic potential of forest sites can be interpreted from analysis of watershed models that express site characteristics as variables. Six streamflow parameters expressing annual and 10-year frequency characteristics were related to 21 to 29 watershed variables. The data for analysis were drawn from 109 watersheds in northern California, covering the period 1881 to 1971. These streamflow records were adjusted to the 81-year record by using one of 10 key stations. The 29 variable, 109 catchment, data matrix was tested for independence by factor analysis. To reduce the correlation between some variables, 16 watersheds were dropped from analysis. Then the quantitative relations were determined by regression using reduced rank principal component analysis. Explained variance ranged from 72 to 87 percent for the annual and flood streamflow parameters, but only 46 to 48 percent for the two low-flow parameters. The quantitative results are given by the 185 regression coefficients obtained. Wide differences in management problems and potentials were indicated. For example, for the nine geologic types tested, annual streamflow potentials were as little as 30 percent of average to more than three times average. Low flows were even more variable, with the granitic rocks yielding low flows only 1 to 3 percent as high as the basic and ultra basic rock types (Basalt and Serpentine). Such differences imply different problems of management for water supply. (Forest Service)
W76-05620

GUIDELINES FOR CHARACTERIZING NATURALLY UNSTABLE OR POTENTIALLY UNSTABLE SLOPES ON WESTERN NATIONAL FORESTS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
D. N. Swanston.
In: New Requirements in Forest Road Construction (FP2406). Proceedings of symposium sponsored by Association of B.C. Professional Foresters and University of British Columbia, Dec. 9-11, 1974. Vancouver, B.C. p 122-136.

Descriptors: *Slope stability, *Soil erosion, Mass wasting, Environmental effects, Soil physical properties, *Forest management, Watershed management, Climates, *Geomorphology, *Lithification, *Vegetation, Hydrology, Bedrock.
Identifiers: *Bedrock lithology.

A technique is presented for developing a qualitative characterization for developing hazard rating of unstable slopes on western forest lands. Six environmental qualities are identified which should be given careful consideration in judging stability of natural slopes in terms of surface erosion and soil mass movement. They are: landform features; soil characteristics; bedrock lithology and structure; vegetative cover; hydrologic characteristics of site; and climate. These are described, and the slope stability factors which each encompasses are discussed. (Forest Service)
W76-05621

HANLON CREEK ECOLOGICAL STUDY, PHASE B.
Guelph Univ. (Ontario). Centre for Resources Development.
For primary bibliographic entry see Field 6G.
W76-05650

FALLOUT CS-137: A TOOL IN CONSERVATION RESEARCH,
Agricultural Research Service, Oxford, Miss.
For primary bibliographic entry see Field 2J.
W76-05690

SEDIMENT CHARACTERISTICS OF FIVE STREAMS NEAR HARRISBURG, PENNSYLVANIA, BEFORE HIGHWAY CONSTRUCTION
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4C.
W76-05854

IMPACTS OF HYDROLOGIC MODIFICATION ON WATER QUALITY,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 5G.
W76-05866

MIAMI RIVER WATERSHED PROJECT: INTRODUCTION,
Argonne National Lab., Argonne, Ill. Radiologic and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05886

PLUTONIUM CONCENTRATIONS IN WATER AND SUSPENDED SEDIMENT FROM THE MIAMI RIVER WATERSHED, OHIO,
Argonne National Lab., Argonne, Ill. Radiologic and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05887

PLUTONIUM IN AQUATIC BIOTA OF THE GREAT MIAMI RIVER WATERSHED, OHIO,
Argonne National Lab., Argonne, Ill. Radiologic and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05888

DEPENDABLE YIELD OF RESERVOIRS WITH INTERMITTENT INFLOWS,
Agricultural Research Service, Stillwater, Ok Water Conservation Structures Lab.
For primary bibliographic entry see Field 4A.
W76-05908

FACTORS INFLUENCING INFILTRATION AND SEDIMENT PRODUCTION OF SEMIARID RANGELANDS IN NEVADA,
Texas A and M Univ., College Station. Dept. Range Science.
For primary bibliographic entry see Field 2G.
W76-05912

SLOPE RUNOFF AND ITS CHANGE UNDER THE EFFECT OF AGRICULTURAL AND FOREST IMPROVEMENT PRACTICES,
For primary bibliographic entry see Field 4C.
W76-05927

SOIL STABILITY AND WATER YIELD AND QUALITY,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station
J. Rothacher, and W. Lopushinsky.
For sale by the Superintendent of Documents U.S. Government Printing Office, Washington D.C. 20402. In: Environmental Effects of Forest Residues Management in the Pacific Northwest State of Knowledge Compendium. USDA Forest Service Technical Report, PNW-24, p D-1 to D-1974. 1 fig, 2 tab, 52 ref.

Descriptors: Soil erosion, *Soil management, *Soil stability, Soil compaction, *Water quality, *Water yield, Watershed management, Forest management, Soil treatment, *Burning, Lumbering, Douglas fir trees.

orest residue activities influence soil and water sources in proportion to the amount they increase soil disturbance. Drastic disturbance of ter and surface soil can lead to surface erosion d stream sedimentation. Residues and residue eatment would not normally increase mass soil osion nor would water yields change signifintly. The quantity of chemicals in streams ineases when rate of decomposition of residues ceeds uptake by vegetation. Burning of forest sidues increases the quantity of chemicals that ay reach streams roughly in proportion to the antity of fuel burned. Broadcast burning after gging of old-growth Douglas-fir increased loss of trient cations 1.6 to 3.0 times that from an unrned area. (Forest Service)
76-05937

FFECTS OF FOREST FERTILIZATION WITH REA ON STREAM WATER QUALITY--QUILENE RANGER DISTRICT, WASHINGTON,
orest Service (USDA), Corvallis, Oreg. Pacific orthwest Forest and Range Experiment Station.
or primary bibliographic entry see Field 5B.
76-05938

EOLOGY AND GEOMORPHOLOGY OF THE J. ANDREWS EXPERIMENTAL FOREST, ESTERN CASCADES, OREGON,
orest Service (USDA), Corvallis, Oreg. Pacific orthwest Forest and Range Experiment Station.
J. Swanson, and M. E. James.
esearch Paper PNW-188, 14 p. 1975. 5 fig, 11 ref.

escriptors: Demonstration watersheds, Geology, oil management, *Geomorphology, *Forest anagement, Mass transfer, *Watershed managent, *Oregon, *Mass wasting.
entifiers: Soil mass movement, *Western scades(Ore).

low and middle elevations in the H. J. Andrews xperimental Forest, the bedrock geology is comsed of Little Butte Formation altered volniclastic rocks, predominantly of ash flow and idflow origin. This unit is overlain by upper iocene and Pliocene lava flows which contain me interbeds of pyroclastic and fluvial material. e present landscape has been formed during apoximately the past 4 million years by fluvial, gla-l, and mass movement processes. Both shallow d deep-seated mass movements tend to occur in relatively unstable rocks of the Little Butte rmation and especially in the contact zone ere lava flows cap unstable volcaniclastic cks. The close link between bedrock geology d mass movements should be useful in forest nagement decisions concerned with lands in the estern Cascades. (Forest Service)
76-05941

MBER PRODUCTION AND WATER QUALI -- PROGRESS IN PLANNING FOR THE LL RUN, PORTLAND, OREGON'S MUCIPAL WATERSHED,
rest Service (USDA), Corvallis, Oreg. Pacific rthwest Forest and Range Experiment Station.
r primary bibliographic entry see Field 5B.
'6-05942

PACT OF FOREST FERTILIZATION ON ATER QUALITY IN THE DOUGLAS-FIR REON -- A SUMMARY OF MONITORING STUES,
'est Service (USDA), Corvallis, Oreg. Pacific rthwest Forest and Range Experiment Station.
primary bibliographic entry see Field 5B.
6-05943

)PE STABILITY PROBLEMS ASSOCIATED FH TIMBER HARVESTING IN MOUNTAINOUS REGIONS OF THE WESTERN UNITED STATES,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-05944

INTERPRETING STABILITY PROBLEMS FOR THE LAND MANAGER,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
D. N. Swanston.
In: New Requirements in Forest Road Construction (FP2406). Proceedings of symposium sponsored by Association of B.C. Professional Foresters and University of British Columbia, Dec. 9-11, 1974. Vancouver, B.C. p. 147-176.

Descriptors: *Slope stability, *Erosion, Mass wasting, Debris avalanches, Soil mechanics, Forest management, Land management, *Canada.
Identifiers: Soil creep, Slumps, Earthflows, Debris flows, Soil mass movement, British Columbia.

Major soil mass movement problems faced by the forest land manager are discussed, with particular emphasis on problems on forest lands in British Columbia, Canada. A basic model describing the mechanics of soil mass movements is presented and the controlling and contributing factors to slope stability under natural and manipulated conditions are discussed. (Forest Service)
W76-05947

ROAD STANDARDS ON STEEP TERRAIN IN THE PACIFIC NORTHWEST U.S.A. WITH SUGGESTIONS FOR IMPLEMENTATION,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-05948

THE FOREST ECOSYSTEM OF SOUTHEAST ALASKA 5. SOIL MASS MOVEMENT,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
D. N. Swanston.
General Technical Report PNW-17, 1974. 22 p. 8 fig, 27 ref.

Descriptors: *Erosion control, *Debris avalanches, *Mass wasting, Slope stability, Excess water(Soils), Forest management, Bedrock, Conservation, *Alaska, Lumbering.
Identifiers: Timber harvesting, *Soil mass movement.

Research in southeast Alaska has identified soil mass movement as the dominant erosion process, with debris avalanches and debris flows the most frequent events on characteristically steep, forested slopes. Periodically high soil water levels and steep slopes are controlling factors. Bedrock structure and the rooting characteristics of trees and other vegetation exert a strong influence on relative stability of individual sites. Timber harvesting operations have a major impact on initiation and acceleration of these movements. The cutting of timber itself has been directly linked with accelerated mass movements, and the accumulation of debris in gullies and canyons has been identified as a major contributor to the formation of large-scale debris flows or debris torrents. The limited road construction on steeper slopes thus far has had a relatively small impact. Effective management practices on such terrain consist of identification and avoidance of the most unstable areas and careful control of forest harvesting operations in questionable zones. (Forest Service)
W76-05950

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

QUALITY AND VARIATION OF POLLUTANT LOADS IN URBAN STORMWATER RUNOFF,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05576

AUTOMATED DILUTION FOR MEASUREMENT OF NITRATE IN WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
P. D. Goulden, and Y. P. Kakar.
Analytical Letters, Vol. 8, No. 10, p 763-768, 1975. 1 fig, 2 tab, 3 ref.

Descriptors: *Analytical techniques, *Waste water(Pollution), *Nitrates, Measurement, Pumps, Sewage effluents, Water analysis, *Pollutant identification, *Automation.
Identifiers: *AutoAnalyzer.

Multiple dilutions on an AutoAnalyzer up to a 1200:1 ratio were performed to analyze nitrate levels in water over the range 2 micrograms/liter to 250 mg/liter nitrogen. The manifold used contained two pumps, one for the first two dilutions and one for the actual nitrate determination. The effects of dilution ratios in a single dilution step were determined and repeated twice to test for reproducibility of the sampling process. A major source of loss of integrity was found to be the debubbling and resampling process. A variety of natural water samples and sewage effluents were analyzed for nitrate by addition at the approximate manifold addition point. The precision of the analysis was determined by analyzing natural water samples and determining the coefficients of variation. It was found that the coefficients of variation over the dilution ranges were not significantly different. The dilution technique is applicable to other analyses besides nitrate in the AutoAnalyzer. (Loustau-FIRL)
W76-05594

STREAM ANALYZERS ARE FOR WASTE AS WELL AS PRODUCT,
A. Klein.
Control Engineering, Vol. 22, No. 12, p 39-41, December, 1975. 5 fig.

Descriptors: *Instrumentation, *Analytical techniques, *Waste water treatment, *Pollutant identification, Automation, Computers, Design, Measurement.
Identifiers: Analyzers, On-line technology.

The latest design and application trends in on-line analytical instruments are described. Two gas analyzers, both instruments designed to be tied in with control loops and computing elements to correct or trim a process, are the type OJ oxygen analyzer and the type UJ particulate monitor, designed by Bailey Meter. Beckman offers an air quality chromatograph that works better than infrared or flame ionization methods. Houston Atlas' hydrogen sulfide gas analyzer utilizes the specific reaction between lead acetate and H2S to form dark lead sulfide which is detected by a CdS photocell and differentiated to provide a dc signal. A Honeywell digital computer and a teletypewriter are teamed up with the old chromatograph system. Continuous on-line analytical service is also offered by L & M in process photometry, differential refractometry, and trace oxygen analysis. The Taylor Instrument Servomex OA-269 industrial flue gas oxygen analyzer can be used on flue or stack gases with a high concentration of condensa-

ble vapors at ambient temperatures. Among liquid analyzers is Delta's total carbon analyzer. It has a nephelometric detector that uses visible light and conventional optics to eliminate the need for filtered microliter sampling such as other detectors might require. Hach's automatic chlorine analyzer uses as a chlorine reagent an orthotolidine solution that is twice as strong as typical solutions. Milton Roy Company offers pH, conductivity, sodium ion, dissolved oxygen, and colorimetric analyzers. A closed loop fuel oil viscosity control system is the newest product of Newton, Massachusetts. (Loustau-FIRL)
W76-05596

TRACE ELEMENT, MINERALOGY, AND SIZE DISTRIBUTION OF SUSPENDED MATERIAL SAMPLES FROM SELECTED RIVERS IN EASTERN KANSAS,
Kansas Univ., Lawrence. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-05606

EFFECTS OF FOREST FERTILIZATION ON TWO SOUTHEAST ALASKA STREAMS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5C.
W76-05612

COMPARATIVE EFFECTIVENESS OF THE STANDARD SURBER SAMPLER AND A HYDRAULIC MODIFICATION FOR ESTIMATING BOTTOM FAUNA POPULATIONS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 7B.
W76-05613

ESTIMATING DRY WEIGHT OF LIVE, UNANESTHETIZED FISH BY PHOTOGRAPHY,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
C. L. Hawkes.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 2, p. 321-324, 1975. 3 fig, 4 ref.

Descriptors: *Photography, Measurement, Fish management, Weight, Toxicity, *Estimating, Fish, Water pollution, *Salmon, *Pollutant identification.
Identifiers: Chronic oral toxicity.

A photographic technique for indirectly estimating the dry weight of live fish is described with an example for fingerling coho salmon (Oncorhynchus kisutch). This technique does not utilize anesthetizing, blotting, or other harsh treatments associated with weighing live fish. It was developed for studies on which size, weight, etc., must frequently be obtained with a minimum of damage to fish. The example given is the development of the regression equation correlating actual dry weights with photographically measured indices of lateral area. The equation obtained has a coefficient of determination (r2) of 0.954. (Forest Service)
W76-05615

NUTRIENT CYCLING IN 37- AND 450-YEAR-OLD DOUGLAS-FIR ECOSYSTEMS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05619

THE APPLICATION OF SEQUENTIAL ESTIMATION METHODS TO COUNTS OF PHYTOPLANKTON,
Comitato Nazionale per l'Energie Nucleare, Rome (Italy). Technological Lab.
F. Moller, and A. Zattera.
Available from the National Technical Information Service, Springfield, Va. 22161, as RT BIO 747 $4.00 in paper copy, $2.25 in microfiche. Report RT/BIO(74)7, February 1974. 75 p, 13 fig, 23 tab, 11 ref.

Descriptors: *Estimating, *Estimating equations, *Phytoplankton, Population, Distribution, Analytical techniques, Average, Computer programs, Sampling.
Identifiers: Sequential estimation, LABEN 70.

Randomly distributed algae may be counted by dividing the sediment surface into parallel fields and enumerating cells in each field. In the fixed counting plan, pre-established square fields are counted and cell numbers extrapolated to the whole surface and sediment volume. In the sequential counting plan, random fields are counted. A population is characterized by its mean and variance. Knowledge of variance permits determination of population homogeniety and confidence in the mean estimation. Component dispersions about the expected mean depend on covariance between counts of individuals of each species. Total dispersion is the sum of dispersions of single components if the correlation coefficient between single and total counts is unity. The parallel field experiment is easier to handle and program. The sequential method applied to parallel fields is described. A program in BASIC language was written for the LABEN 70 computer. Use of the sequential method seemed justified because of the time needed for counting and statistical characterization of results. Application depends on population concentrations on the sediment surface. The method can be used to count algae in cultures and natural phytoplankton populations and applied in relation to the sediment volume related with the higher or lower count. (Buchanan-Davidson--Wisconsin).
W76-05622

AN ICHTHYOFAUNAL SURVEY AND DISCUSSION OF FISH SPECIES DIVERSITY AS AN INDICATOR OF WATER QUALITY, CODORUS CREEK DRAINAGE, YORK COUNTY, PENNSYLVANIA,
York Coll., Pa.
R. F. Denoncourt, and J. W. Stambaugh.
Proceedings Pennsylvania Academy of Science, Vol. 48, p. 71-78, 1974. 4 fig., 3 tab., 24 ref.

Descriptors: *Fish, *Varieties, *Surveys, *Baseline studies, Pennsylvania, Water pollution effects, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Water quality, Tributaries, Bioindicators.
Identifiers: *Codorus Creek(Pa.), York County(Pa.), Species diversity indices.

Fish distribution and physical parameters were studied during 1970-1973 in Codorus Creek, Pennsylvania. A total of 6806 fish representing 6 families, 23 genera, and 41 species of hybrid combinations were collected. Fish in the Main and West Branches included many typical of warm waters and minnows tolerant of moderate to heavy pollution. The East and South Branches contained many minnows with low tolerance to organic pollution, a few typical of warm water, and no goldfish or carp. Temperature rose in some downstream sites and dissolved oxygen decreased due to sewage effluents. Hydrogen ion concentration was usually 7.3-7.7 and showed no consistent or significant variation. The mean number of species followed the increase in species number with increasing stream order. The mean and range of species diversity indices showed the same deviations as total species number and mean number of species. Use of fish species diversity indices for water quality assessment not recommended. Decreasing oxygen may have caused decreased fish diversity below Spring Grove and York. Dissolved oxygen, species number, and species diversity followed the same trends. Lists of fish species taken in Codorus Creek and its tributaries (East Branch, South Branch and Tyler Run), and species diversity indices, are given. (Buchanan-Davidson--Wisconsin)
W76-05634

ASSESSMENT OF A STRESSED MACROINVERTEBRATE COMMUNITY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-05636

RAPID DETERMINATION OF THE COD OF EFFLUENTS (USKORENNOE OPREDELENIE KHPK STOCHNYKH VOD),
Tsentral'nii Nauchno-Issledovatel'skii i Proektnii Institut Lesokhimicheskoi Promyshlennosti, Khimki (USSR).
G. A. Ishcherikova, N. P. Drozdov, N. V. Galyanova, and L. N. Smirnova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 7, p 25, 1975. 1 ref.

Descriptors: *Pollutant identification, *Water analysis, *Chemical oxygen demand, *Effluents, Volumetric analysis, Biochemical oxygen demand, Water properties, Water quality, Analytical techniques, Testing procedures, Water pollution sources, Chemical wastes.
Identifiers: Syava silvichemical factory(USSR).

This method for COD determination uses only simple equipment and is suitable for routine plant control determinations. A 10 ml sample (diluted if necessary) is placed in an Erlenmeyer flask, 10 ml of a 0.2 normal solution of potassium dichromate and 30 ml concentrated sulfuric acid containing the catalyst are added, and the mixture is heated on an electric plate for 10 minutes. Following dilution with water to 100 ml, titration is conducted with a 0.05 normal solution of Mohr's salt in the presence of o-phenanthroline indicator. The COD values obtained are equal to 88.5% of values obtained by the standard method. A correction factor is used to express the COD in values corresponding to those obtained by the standard method. It was established that to 5-day BOD of the Syava silvichemical factory effluent is 62% of its COD. Thus, the 5-day BOD can be calculated directly from COD. (Stapinski-IPC)
W76-05705

ANALYSIS OF PULP AND PAPER MILL WASTE WATERS BY HIGH-RESOLUTION ION-EXCHANGE CHROMATOGRAPHY,
Oregon Univ., Portland.
A. W. Lis, R. K. McLaughlin, J. Trau, G. D. Daves, Jr, and W. R. Anderson, Jr.
Tappi, Vol. 59, No. 1, p 127-129, Jan., 1976. 3 fig, 13 ref.

Descriptors: *Pulp wastes, *Water analysis, *Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Aeration, Ion exchange, Chromatography, Water pollution, Effluents, Biochemical oxygen demand, Organic compounds, Aerated lagoons.
Identifiers: Magnefite pulping, Magnesium-base sulfite pulping, Sulfite pulp mills, Refiner groundwood pulp, Ultraviolet spectroscopy, Mechanical pulp mills.

A high-resolution anion-exchange analyzer was used to detect ultraviolet-absorbing components of waste waters from a pulp and paper mill using both Magnefite (Mg-base sulfite) and refiner mechanical (groundwood-from-chips) pulping processes. Approximately 25 major ultraviolet-absorbing peaks were obtained from the influent of two aerated treatment lagoons, and 113 peaks were found in the effluent of the second lagoon. Effectiveness of the aeration treatment exceeded 90%. Spectrometric examination of a large peak of the influent revealed a complex mixture of hydrocarbon-like materials. This method is com-

red to a general pollution index (BOD). (Sykes-C)
76-05709

APID PHOTOCHEMICAL DECOMPOSITION F ORGANIC MERCURY COMPOUNDS IN ATURAL WATER,
ilips Gloeilampenfabrieken N.V., Eindhoven etherlands). Forschungslaboratorium.
M. Kiemeneij, and J. G. Kloosterboer.
alytical Chemistry, Vol. 48, No. 3, p 575-578, arch, 1976. 6 fig, 9 ref, 1 tab.

scriptors: *Water analysis, *Mercury, ollutant identification, Trace elements, Ul-violet radiation, Analytical techniques, Inor-nic compounds, Water pollution sources, emicals, Water pollution, Natural streams, ater properties, Water chemistry, Metals, Tox-ty.

method has been developed for the determina-n of total mercury in water at concentrations in parts per billion (ppb) range. Decomposition of gano mercurials is carried out by means of ul-violet radiation of a suitable wavelength from all low-pressure lamps containing either Zn, Hg, or a mixture of these metals in their hodes. The formed inorganic mercury is deter-ned in the usual way by cold vapor atomic ab-rption after reduction of Hg(++) to Hg. Deter-nations with and without irradiation make possi-separate determination of total and inorganic rcury, respectively. Irradiation times are ap-ximately 20 minutes. The photochemical analy-of natural water samples is compared with the t-chemical analysis. The results agree within 4% a level of 1 microgram/liter, even for unfiltered mples. The photochemical method, which uires a minimum of reagents, yields substan-ly lower blank values than the wet-chemical thod. (Witt-IPC)
76-05715

MOVAL OF COPPER AND IRON PRIOR TO ATER HARDNESS TITRATION,
ergy Research and Development Administra-n, Ames, Iowa; and Ames Lab., Iowa.
. Fritz, and J. N. King.
alytical Chemistry, Vol. 48, No. 3, p 570-572, rch, 1976. 10 ref, 2 tab.

scriptors: *Water analysis, *Hardness(Water), pper, *Iron, Separation techniques, Silica, ls, Calcium, Magnesium, Analytical hniques, Water properties, Water quality, ter pollution sources, *Pollutant identification.

ca gel was reacted with 3-aminopropyltriethox-ane or with the N-methyl derivative of the e reagent to produce a material with an amino l functional group. When a water sample of pH 7.5 is passed through a short column of this erial, iron (II) and copper (II) are completely ined, while calcium (II) and magnesium(II) s through. This permits an accurate water hard-s titration without adding any cyanide. (Witt-)
6-05716

TRACTION - VISIBLE SPEC-OPHOTOMETRIC METHOD FOR DETER-NATION OF NITRATE: APPLICATION TO TER ANALYSIS,
reb Univ. (Yugoslavia).
Siroki, Z. Stefanac, and L. J. Maric.
rochemical Journal, Vol. 20, No. 4, p 483-491, ., 1975. 5 fig, 8 ref, 2 tab.

criptors: *Water analysis, *Nitrates, Spec-hotometry, Colorimetry, Analytical niques, Chemical analysis, Water pollution rces, *Pollutant identification, Separation niques, Color, Potable water, Color reactions, e elements, Water chemistry, Water proper-Water quality.

A colorimetric method for the determination of nitrate is described. The method is based on the extraction of nitrate with tetraphenylphosphonium chloride followed by the exchange of nitrate in the extract with intensely colored vanadium-4-(2-pyridylazo)resorcinol complex and spectrophotometric measurement of the latter. The color intensity of the extract is stable and reproducible. The application of the method to water analysis was investigated, and a procedure for the determination of nitrate in drinking water is developed. (Witt-IPC)
W76-05717

WATER POLLUTION IN CONNECTION WITH BARK DUMPING (VATTENFORORENINGAR I SAMBAND MED BARKDEPONERING),
Swedish Cellulose Co., Sundsvall.
For primary bibliographic entry see Field 5B.
W76-05726

A COULOMETRIC DEVICE FOR MEASURING TOTAL OXYGEN DEMAND,
Philips Gloeilampenfabrieken N.V., Eindhoven (Netherlands).
American Laboratory, Vol. 8, no. 1, p 41-43, January, 1976. 2 fig, 3 illus.

Descriptors: *Water analysis, *Oxygen demand, Analytical techniques, Water properties, Instruments, Trace elements, Water quality.
Identifiers: *Coulometry.

The total oxygen demand of a water sample is determined by measuring the amount of oxygen consumed when the oxidizable matter in the sample is burned in a gas containing oxygen. The sample is injected into a stream of gas of known oxygen content, and the decrease in oxygen concentration is measured coulometrically after combustion. The meter display of the instrument gives a direct reading of absolute total oxygen demand in mg oxygen/liter. The meter has linearity in all ranges and a wide measuring range (zero to 10,000 mg oxygen/liter total oxygen demand). No calibration curve is necessary and no reagents are required. (Witt-IPC)
W76-05728

CHEMICAL CHARACTERIZATION OF FIBER BUILDING BOARD MILL EFFLUENT,
Swedish Forest Products Research Lab., Stockholm.
U. M. B. Jansson, and E. L. Back.
Wood Science, Vol. 8, No. 2, p 112-121, Oct., 1975. 2 fig, 33 ref, 7 tab.

Descriptors: *Water pollution sources, *Pulp wastes, *Pollutant identification, Waste water(Pollution), Water properties, Wastes, Industrial wastes, Carbohydrates, Lignins, Trace elements, Water quality, Orgnic compounds.
Identifiers: *Building board, White water, Asplund pulp, Glucomannan, Xylan, Klason lignin, Hardboards, Hemicelluloses.

Two pine hardboard white waters, warm water extracts of spruce and mixed hardwood Asplund pulps, and the pulps themselves were analyzed. About one-half of the solids in white waters and extracts was of carbohydrate origin, 15-20% was lignin-related, and 2-5% was inorganic. Glucomannan was dissolved to a greater extent than was the xylan. Most of the acetyl groups remained in the pulps. Ultrafiltration of the white waters and spruce extract indicated that the xylan and arabinan components had a lower molecular weight than the glucomannan components, and that the Klason lignin in the white waters had a higher molecular weight than that of the extracts. (Buchanan-IPC)
W76-05731

AN AUTOMATED TECHNIQUE FOR THE SUB-MICROGRAM DETERMINATION OF SELENIUM AND ARSENIC IN SURFACE WATERS BY ATOMIC ABSORPTION SPECTROSCOPY,
Utah State Div. of Health, Salt Lake City, Bureau of Laboratories.
F. D. Pierce, T. C. Lamoreaux, H. R. Brown, and R. S. Fraser.
Applied Spectroscopy, Vol. 30, No. 1, p 38-42, January/February, 1976. 5 fig, 6 ref, 3 tab.

Descriptors: *Arsenic compounds, *Water analysis, *Spectroscopy, Analytical techniques, *Pollutant identification, Water pollution sources, Spectrophotometry, Natural streams, Trace elements, Automation.
Identifiers: *Selenium, Hydrogen selenide, *Arsenic.

A description is given of a fully automated method for the analysis of Se and As in surface waters by atomic absorption spectroscopy. The technique employs sodium borohydride for conversion of Se and As compounds in speciments to hydrogen selenide and arsine. To increase the efficiency of hydride recovery for analysis, the reacted specimen is stripped using a heated column. The hydride gas and hydrogen evolved from the chemical reaction is then combusted in a tube furnace placed in the optical path of an atomic absorption spectrophotometer. Seventy specimens can be analyzed/hr with a detection limit of 0.019 micrograms/liter for Se and 0.011 micrograms/liter for As. (Witt-IPC)
W76-05736

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VOL. II,
VTN, Inc., Orlando, Fla.
For primary bibliographic entry see Field 5G.
W76-05744

IMPACT OF COAL STRIP MINING ON WATER QUALITY AND HYDROLOGY OF EAST TENNESSEE,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05833

NATURE AND STABILITY OF COMPLEX MERCURY COMPOUNDS IN SURFACE AND GROUND WATERS, PHASE II,
Auburn Univ., Ala. Dept. of Chemistry.
J. E. Land, W. R. Mountcastle, H. T. Peters, and C. Sinkule.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 375, $4.50 in paper copy, $2.25 in microfiche. Alabama Water Resources Research Institute, Auburn, Bulletin 24, January 1976. 54 p, 10 fig, 4 tab, 23 ref. OWRT A-038-ALA(1).

Descriptors: *Phosphates, Chelation, *Hydrolysis, *Mercury, Metals, Aqueous solutions, Mathematical models, Equilibrium, Ions, *Pollutant identification, Analytical techniques.
Identifiers: *Methylmercury, Stability constants, Ionic equilibria, Ligands, Complexing, Ionic species, Polymeric complexions.

Attempts to determine the hydrolytic and polymeric species present at 25C in an aqueous solution of methylmercury hydroxide, with an ionic strength of 0.10M using potassium nitrate, as a function of the hydronium ion concentration by means of electromotive force measurements and polarographic analysis are described. Three mathematical models are presented which might account for the possible equilibria involved and arguments based upon collected data are advanced to show that one of these is more likely than the other two. To ascertain if slow attainment of equilibrium between the methylmercury species was causing the electromotive force and reduction

potentials to be meaningless, studies were made at a higher temperature of 35C, but the results were inconclusive. Calculations of stability constants for methylmercury - ligand systems proved to be impossible since the hydrolytic equilibria are undetermined. (See also W74-02441)
W76-05838

SELECTED WATER-QUALITY DATA FROM FALLEN LEAF LAKE, EL DORADO COUNTY, CALIFORNIA, JUNE THROUGH OCTOBER 1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W76-05848

LIMNOLOGICAL DATA FOR THE MAJOR STREAMS IN CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W76-05852

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF EASTERN MONTANA, 1975-76,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W76-05853

TABLE OF DATA ON WATER QUALITY OF BAKER LAKE NEAR MOUNT BAKER, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W76-05857

HYDROGEOCHEMICAL DATA FROM INVESTIGATION OF WATER QUALITY IN SEWERED AND UNSEWERED AREAS, SOUTHERN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 7C.
W76-05858

FLORIDAN AQUIFER IN NORTHEAST FLORIDA--THREE MAPS--HARDNESS OF WATER, CHLORIDE CONCENTRATION, AND POTENTIOMETRIC SURFACE, MAY 1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-05859

GEOHYDROLOGY OF THE EVANGELINE AND JASPER AQUIFERS OF SOUTHWESTERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 2F.
W76-05861

AVAILABILITY OF GROUND WATER IN THE ANDROSCOGGIN RIVER BASIN, NORTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N.H.
For primary bibliographic entry see Field 7C.
W76-05862

AN ASSESSMENT OF AUTOMATIC SEWER FLOW SAMPLERS - 1975,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W76-05864

COMPILATION OF METHODOLOGY USED FOR MEASURING POLLUTION PARAMETERS OF SANITARY LANDFILL LEACHATE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. S. K. Chian, and F. B. DeWalle.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 102, $7.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/3-75-011, October 1975. 163 p, 38 fig, 1 tab, 32 ref, 2 append. EPA 1DB064; ROAP 21BFQ; Task 002 C1 68-03-2052.

Descriptors: Chemical analysis, *Landfills, Biochemical oxygen demand, *Leachate, Waste disposal,*Leaching, *Pollutant identification, Colorimetric analysis, Solid wastes, Chemical analysis, Lysimeters, Analytical techniques, Methodology.
Identifiers: Leachate analysis.

Different analytical methods can be used to determine a specific parameter; a preliminary laboratory evaluation was made of those methods least subject to interferences. All analyses were conducted with a relatively concentrated leachate sample obtained from a lysimeter filled with milled solid waste. The results indicate that strong interferences are sometimes encountered when using colorimetric tests due principally to the color and suspended solids present in leachate. In such instances alternative methods were evaluated or recommendations were made to reduce the interfering effects. Automated chemical analysis using colorimetric methods can sometimes experience significant interferences. (EPA)
W76-05869

NUCLEAR TECHNIQUES IN HYDROLOGY--CURRENT STATUS AND PROSPECTIVE USES.
National Academy of Sciences, Washington, D.C.; National Committee for the International Hydrological Decade, Washington, D.C
Final Report of the Work Group on Nuclear Techniques in Hydrology of the U.S. National Committee for the International Hydrological Decade, National Academy of Sciences, Washington, D.C., 1975. 43 p, 3 append.

Descriptors: *Hydrology, *Isotope studies, *International Hydrological Decade, Radioisotopes, Stable isotopes, Deuterium, Tritium, Tracers, Neutron absorption, Gamma rays, Snow, Ice, Surface waters, Groundwater, Water pollution, Pollutants, Radioactivity techniques, Pollutant identification, Path of pollutants.
Identifiers: *Nuclear techniques.

Nuclear techniques in hydrology are those which use stable or radioactive isotopes, either natural or man-made or radioactive emissions, to provide partial or complete answers to specific questions concerning the flux of water and material dissolved or suspended in it, fluid transport and deposition, the framework of aquifers and watersheds, and the physical, chemical, and biological processes occurring within the hydrological cycle. The application of these techniques to hydrological studies falls short of the potential inherent in even the existing technology. Further, the basic science shows promise of being applicable to many new study areas. The two principal reasons for the limited use of nuclear techniques in hydrology are: (1) the existence in many instances of established non-nuclear techniques, and (2) the shortage of hydrologists familiar with nuclear techniques and their possibilities. A summary outline of the application of nuclear techniques in hydrology was presented in an appendix. (Sims-ISWS)
W76-05922

MIREX RESIDUES IN SELECTED ESTUARIES OF SOUTH CAROLINA: JUNE 1972,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
P. W. Borthwick, G. H. Cook, and J. M. Patrick, Jr.
Pestic Monit J. 7(3/4): 144-145. Illus.1974.

Descriptors: *Pesticide residues, *South Carolina, *Estuaries, Fish, Sediments, Crabs, Shrimp, Insect control, *Pollutant identification, Monitoring, Sunfishes, Catfishes, Crap, Bottom sampling.
Identifiers: *Mirex, Fire ants, Blue crabs.

Estuarine sediments, crabs, shrimps and fishes were collected in June 1972 at 11 stations 2 yr after aerial applications of mirex bait for control of fire ants in coastal areas near Charleston, South Carolina. These stations had previously been monitored (Oct. 1969-June 1971) when levels of mirex in animal samples were: crabs, 0-0.60 ppm; shrimps, 0-1.3 ppm; and fishes, 0-0.82 ppm. The recent study showed that mirex was present in 3 species of fishes (white catfish, 0.021 ppm; bluegill, 0.047 ppm; carp, 0.12 ppm) and blue crabs (0.026 ppm) at freshwater stations. However, mirex was not detected in 36 animal samples, most of which were taken from 9 saline stations in the estuaries after a period of restricted use of the pesticide. Analysis of bottom sediment samples at all stations detected no mirex. The lower limit of detection of mirex was 0.01 ppm.--Copyright 1974, Biological Abstracts, Inc.
W76-05954

PORTABLE WATER SAMPLING APPARATUS,
Universal Oil Products Co., Des Plaines, Ill. (Assignee).
For primary bibliographic entry see Field 7B.
W76-05958

APPARATUS FOR COLLECTING SURFACE PARTICLE ON BODY OF WATER,
For primary bibliographic entry see Field 5G.
W76-05970

INSTRUMENTAL METHOD FOR THE DETERMINATION OF TRACE ELEMENTS IN WATER SAMPLES BY NEUTRON ACTIVATION ANALYSIS,
Comitato Nazionale per l'Energia Nucleare, Casaccia (Italy). Laboratorio Radioattivita Ambientale.
G F Clemente, and G. G. Mastinu.
J Radioanal Chem. 20(2): 707-714. 1974.

Descriptors: *Neutron activation analysis, *Spectrometer, Analytical techniques, Computers, Gamma rays, Trace elements, Water analysis.
Identifiers: Italy.

Thermal neutron activation analysis and a large volume high-resolution Ge(Li) y-ray spectrometer connected on-line to a computer, were used to measure the concentrations of Na, Sc, Cr, Fe, Co, Ni, Zn, As, Se, Br, Rb, Ag, Sb, Cs, W and Hg in some Italian subsurface water samples. The instrumental method requires neither a chemical separation technique nor a pre- or post-concentration of the trace elements to be detected. This method eliminates many inherent errors associated with chemical determinations. The technique is sensitive, precise and particularly suitable for routine analysis of many trace elements at both natural and pollution levels in water samples. The interferences due to fast neuron (n, p) and (n, a) reactions are not appreciable, with the only exception of the 54 Fe(n, p) 54Mn and 58 Ni(n, p) 58Co reactions. Losses of volatile elements, e.g. As, Br and Hg, during irradiation was negligible.--Copyright 1975, Biological Abstracts, Inc.
W76-05998

THE RELIABILITY OF MERCURY ANALYSIS IN ENVIRONMENTAL MATERIALS,
International Atomic Energy Agency, Vienna (Austria).
J. Heinonen, and O. Suschny.

Radioanal Chem. Vol 20 No 2 p 499-519. 1974.
lus.

escriptors: *Mercury, *Analysis, Analytical chniques.
lentifiers: Activation analysis, Atomic absorpon analysis.

ine intercomparisons of the determination of Hg esent as impurity in different materials ncluding food) were organized. Laboratories (24) 10 different countries took part, mainly using tivation analysis and atomic absorption chniques. The reliability of the data produced d reported in this area leaves much to be sired, and continuous control of the quality of g analysis in the extremely low concentration nge is essential.--Copyright 1975, Biological Abracts, Inc.
76-06007

HEMICAL CHARACTERIZATION OF INDUSRIAL WASTEWATERS BY GAS CHROATOGRAPHY-MASS SPECTROMETRY,
nvironmental Research Lab., Athens, Ga.
H. Keith.
i Total Environ. 3(1): 87-102. 1974.

escriptors: *Pollutant identification, Chemical astes, *Gas chromatography, *Mass spectroscopy, Legislation, *Organic wastes, Louisiana, vers, *Industrial wastes.
entifiers: Calcasieu River(La).

ganic pollutants in 7 industrial wastewaters ing discharged into the Calcasieu River in Louina (USA) were identified by gas chromatogphy and mass spectrometry. Discharge of comunds not indicated from the manufacturer's lists products and raw materials were revealed. emical characterization provided information rtinent for pollution legislation enforcement.--pyright 1975, Biological Abstracts, Inc.
76-06008

AUSE AND IDENTIFICATION OF TASTE ND ODOUR COMPOUNDS IN WATER,
jksinstituut voor Drinkwatervoorziening, The gue (Netherlands).
Cees, J. Zoeteman, and G. J. Piet.
i Total Environ. 3(1): 103-115. 1974.

scriptors: *Pollutant identification, *Odor, aste, Algae, Water pollution sources, Organic stes, Organic compounds, Potable water, croorganisms, Effluents.
ntifiers: Chlorinated compounds, etherlands.

or compounds in water may originate from instrial and municipal sewage effluents or from logical activities of algae and heterotrophic croorganisms. The relative importance of these ources of odor substances is discussed for The therlands. A number of organic compounds that responsible for odor problems in effluent ter, river water and drinking water are sented. Different chlorinated compounds cause ensive water odors. Some recommendations for ximum allowable concentrations of odor comnds in effluents, surface waters and drinking er are given.--Copyright 1975, Biological Abcts, Inc.
6-06009

HNOLOGICAL CHARACTER OF EXPERINTAL RESERVOIRS TREATED WITH TOX 30% (DDT, DMDT, GAMMA HCH),
ional Inst. of Hygiene, Warsaw (Poland). Dept. Communal Hygiene.
primary bibliographic entry see Field 5C.
5-06012

TRACE METALS IN THE WATERS OF THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
J. M. Bewers, I. D. MaCaulay, and B. Sundby.
Can J Earth Sci. 11(7): 939-950. 1974.

Descriptors: Metals, Trace elements, Gulfs, Cadmium, Cobalt, Copper, Iron, Lead, Nickel, Zinc.
Identifiers: *Gulf of St Lawrence.

Concentrations of the trace elements, Fe, Co, Ni, Cu, Zn, Cd, and Pb were measured in samples collected from the waters of the Gulf St. Lawrence. Cobalt, cadmium, and lead occurred at or below the detection limits of the analytical method. The mean concentrations of Ni, Cu and Zn were 0.4 microgram/l, 0.6 microgram/l and 1.8 microgram/l, respectively, and there was no evidence that local conditions influence their distribution. The distribution of dissolved and colloidal Fe is related to dilution and precipitation processes which occur as fresh and saline waters are mixed. The particulate iron distribution is largely governed by water circulation patterns and settling.--Copyright 1975, Biological Abstracts, Inc.
W76-06024

SOME HELMINTHS OF BULINUS TRUNCATUS AND BIOMPHALARIA ALEXANDRINA FROM THE IRRIGATION SYSTEM NEAR CAIRO,
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
B. Rysavy, F. Moravec, V. Barus, and F. Yousif.
Folia Parasitol (Prague). 21(2): 97-105. 1974.

Descriptors: *Snails, Africa, Irrigation systems.
Identifiers: *Biomphalaria-Alexandrina, *Bulinus-Truncatus, Cairo, Echinopharyphium-Recurvatum, Echinostoma-Revolutum, *Egypt, Enoplidae, *Helminths, Paramphistomatidae, Rhabditis-Sp, Strigeidae, Xiphidiocercaria.

The helminth fauna of snail intermediate hosts of schistosomes pathogenic to man were studied. The snails were collected in the area of Warak El Arab (north of Cairo, Egypt). The snail B. alexandrina was infected with cercariae of the trematode Echinostoma revolutum and with Rhabditis sp., apparently a pseudoparasitic nematode species. The snail B. truncatus was infected with cercariae of Echinoparyphium recurvatum, 1 cercarial species each of the families Strigeidae and Paramphistomatidae, with a xiphidiocercaria, and with nematodes of the family Enoplidae. Both snail species harbored metacercariae of E. revolutum and E. recurvatum, those of a strigeid species, and 2 other metacercarial species (xiphidio-metacercariae). Descriptions and drawings are given for all helminth species found except for those described and figured in other papers. The echinostome trematodes E. revolutum and E. recurvatum were chosen for experimental study on larval competition with human schistosomes in shared snail hosts.--Copyright 1975, Biological Abstracts, Inc.
W76-06028

A NOTE ON THE USE OF ALGAL SIZES IN ESTIMATES OF POPULATION STANDING CROPS,
Victoria Univ. of Manchester (England). Pollution Research Unit.
E. G. Bellinger.
Br Phycol J. 9(2): 157-161. 1974.

Descriptors: *Standing crops, *Algae, Estimating, *Phytoplankton, *Systematics, Biomass.

Counts of cell numbers of phytoplankton algae of differing sizes do not accurately reflect the biomass of the population present. For a better estimate it is suggested that cell numbers be multiplied by the average cell volume for each species present. Data on cell volumes for certain species are given and compared with results from other authors. Surface areas and surface area to volume ratios are also given and the importance of these parameters noted.--Copyright 1974, Biological Abstracts, Inc.
W76-06043

ION EXCHANGE TECHNIQUE FOR THE DETERMINATION OF CHLORINATED PHENOLS AND PHENOXY ACIDS IN ORGANIC TISSUE, SOIL, AND WATER,
National Swedish Environment Protection Board, Stockholm. Wallenberg-Lab.
L. Renberg.
Anal Chem. 46(3), p 459-461, 1974.

Descriptors: *Ion exchange, *Pollutant identification, *Phenols, *Organic acids, Organic compounds, Soils, Eels, Fish, Analytical techniques.
Identifiers: *Chlorinated phenols.

Diazomethane is used as methylation agent in the method described. In the case of the phenoxy acetic acids, a new derivatization procedure is developed. Besides the methyl esters, the 2-chloroethyl esters are also prepared. The method was tested on fish found dead in a river in the south of Sweden where a discharge of the fungicide pentachlorophenol was suspected. A water sample, taken 2 days later also was analyzed. The levels of pentachlorophenol were in accordance with those found to be lethal for the eel.--Copyright 1975, Biological Abstracts, Inc.
W76-06122

DETERMINATION OF SELENIUM IN NATURAL WATERS USING THE CENTRIFUGAL PHOTOMETRIC ANALYZER,
Tennessee Univ., Knoxville. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W76-06128

MERCURY IN SEDIMENTS OF THE HORWER BUCHT (LAKE LUCERNE) AND TRIBUTARY STREAMS, SWITZERLAND,
Hobart and William Smith Coll., Geneva, N. Y. Dept. of Chemistry.
T. R. Blackburn.
Schweiz Z Hydrol. 35(2), p 201-205, 1973.

Descriptors: *Mercury, *Lake sediments, Europe, Lakes, Bays, *Pollutant identification, Distribution patterns.
Identifiers: *Atomic absorption analysis, *Lake Lucerne(Switzerland).

The Hg content of sieved, dried sediments from 24 sampling sites in the Horwer Bucht (Lake Lucerne) and its principal tributary stream system in Horw LU (Switzerland) was determined by flameless atomic absorption analysis. Mercury content significantly above background levels was found at several points. The distribution of Hg in the bay sediments implies that the Steinibach (principal tributary of the Horwer Bucht) is the principal supplier of Hg to the bay.--Copyright 1974, Biological Abstracts, Inc.
W76-06136

MERCURY OCCURRENCE IN SEDIMENT CORES FROM WESTERN LAKE ERIE,
Bowling Green State Univ., Bowling Green, Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W76-06137

EVALUATION OF SURFACE WATER POLLUTION AT SEVERAL POINTS IN RELATION TO ZONES OF SHELLFISH INDUSTRY IN ROADSTEADS OF THE BREST REGION, (IN FRENCH),
For primary bibliographic entry see Field 5B.
W76-06150

5B. Sources Of Pollution

OPTIMAL GROUNDWATER QUALITY MANAGEMENT: WELL INJECTION OF WASTE WATERS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis.
Water Resources Research, Vol. 12, No 1, p 47-53, February 1976. 2 fig, 3 tab, 24 ref, append.

Descriptors: *Groundwater, *Management, *Water quality control, *Waste water disposal, Injection wells, Optimization, Conjunctive use, Pumping, Recharge, Constraints, Design, Planning, Biochemical oxygen demand, Equations, Mathematical models, Systems analysis, Aquifer.
Identifiers: Cost minimization, Mixed integer programming.

Groundwater aquifers are assuming an important role as potential sites for the disposal of waste waters. A mathematical planning model for optimal conjunctive utilization of the groundwater quality and quantity resources of unconfined aquifers is presented. The saturated zone of the groundwater system is considered to be a component of a regional waste treatment system involving a waste water treatment plant and external sources of dilution. It is assumed that a waste load is discharged to the system by well injection at a number of predetermined injection sites. The pumping and recharge rates are supposed not to vary with time. Water quality constraints are maintained at each pumping well to protect the water supply resources and at the recharge wells to prevent fouling of the wells by organic matter and to preserve the hydraulic capacity of the aquifer. The model minimizes the cost associated with surface waste treatment while maintaining acceptable water quality levels throughout the aquifer. Results indicate the feasibility of secondary treatment (trickling filter) plus dilution water along with the assimilation capacity of the aquifer for waste water degredation. (Bell-Cornell)
W76-05507

RECENT TRENDS IN WATER QUALITY MANAGEMENT AND PROTECTION IN HUNGARY,
National Water Authority, Budapest (Hungary). Water Pollution Control.
For primary bibliographic entry see Field 5G.
W76-05518

PROCESS FOR BIOCHEMICAL REACTIONS,
Gary Aircraft Corp. San Antonio, Tex. (Assignee).
For primary bibliographic entry see Field 5D.
W76-05542

EXAMINATION AND REMOVAL OF IRON IN GROUNDWATER,
Sunnittelukeskus-MKR, Helsinki (Finland).
T. Hatva, Niemisto, and H. Seppanen.
Aqua Fennica p. 82-94, 1973, 13 fig., 2 tab., 17 ref.

Descriptors: *Iron, Groundwater, *Iron bacteria, *Oxidation-reduction, Potential, Oxidation, Wells, Hydrogen ion concentration, Pseudomonas, Chlamydomonas, Chelation.
Identifiers: *Vyredox method, Pseudomonadales, Chlamydobacteriales, Eh-measurement, Hemoglobine, Pertumaa, Finland, Gallionella.

The Vyredox-method of iron removal from groundwater is based on the idea of oxidizing and precipitating iron in the ground. This is done by pumping oxygen saturated, iron-free water into the ground. As a result of the oxidation, the redox equilibrium of the groundwater area rapidly changes to oxidizing conditions, while iron and manganese are precipitated. The change in equilibrium can be extended to a desired area and depth with oxidation wells and an adjustment of the oxidation rate. The principle of the Vyredox method involves the formation of a steady gradient in the groundwater. This gradient is often sharp and is recognized by a brown, ferric iron containing zone in the soil. It can be easily recognized in the field and has a significance in determining the most advantageous place and level for groundwater. It is an excellent medium for the growth of gradient organisms such as iron and manganese bacteria. (Ukayli-NWWA)
W76-05571

SUBSURFACE DISPOSAL OF LIQUID INDUSTRIAL WASTES,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
J. A. Vonhof, and R. O. van Everdingen.
CIM Transactions, Vol. 76, p. 120-126, 1973, 5 fig, 1 tab, 11 ref.

Descriptors: *Waste disposal wells, *Injection wells, *Waste water disposal, Liquid wastes, *Canada, Industrial wastes, Subsurface investigations, Deep wells, Brines, *Brine disposal, Water pollution sources.
Identifiers: *Subsurface disposal, *Deep-well injection, Environmental control.

Since 1949, a total of 49 disposal wells have been installed in Canada to inject liquid wastes from refineries, mining operations and chemical plants into subsurface formations at an ever increasing rate. Well depths range from 600 to 5,500 feet; injection rates range from 0.5 gpm (U.S.) to more than 1,000 gpm. Deep-well injection is becoming increasingly more attractive as a method of disposing of liquid industrial wastes. Natural liquid wastes such as oil field brines are less hazardous to the subsurface environment than foreign liquid wastes such as industrial wastes. Apart from strictly technical considerations of well design, the geological, hydrodynamic conditions at the disposal site have a strong bearing on the safety and success of such operations. Prevailing hydrogeological conditions in large portions of the country do not allow safe subsurface disposal. (Gass-NWWA)
W76-05573

QUALITY AND VARIATION OF POLLUTANT LOADS IN URBAN STORMWATER RUNOFF,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
R. L. Droste, and J. P. Hartt.
Canadian Journal of Civil Engineering, Vol. 2, No. 4, p 418-429, December, 1975. 2 fig, 10 tab, 25 ref.

Descriptors: *Urban runoff, *Storm runoff, *Water pollution, *Hydrographs, *Pollutant identification, Precipitation(Atmospheric), Waste water treatment, Tertiary treatment, Sampling, Monitoring, *Canada.

Research into the pollutional loadings of urban storm water was carried out on samples of 13 storms throughout a year in the heavily industrialized town of Windsor, Ontario. Stage levels in the sewers were continuously monitored by a water level recording instrument and hydrographs were made. Samples of discharge were taken and analyzed for such qualities as pH, alkalinity, hardness, BOD, presence of suspended solids, chemical content, and determination of grease and oil. Seasonal and annual average concentration values were calculated and recorded in tabular form. It was found that urban stormwater runoff makes a significant contribution to pollution of receiving waters and is not a suitable diluent for sanitary sewage. Runoff delivers a greater pollutant load than effluent from a secondary treatment plant. Significant correlation was found among the following constituents' concentrations: specific conductance and calcium hardness and chlorides; calcium hardness and total hardness; sulfates and total hardness; and total alkalinity and total hardness. Spring, the season with the most rainfal contributed the highest loads of pollutants exce for chlorides and coliforms. Larger amounts precipitation contributed higher loads to receivi waters. The concentration data given here can used to plan more efficient treatment of storm water runoff and to compare the economies a efficiencies of tertiary treatment against treatme of urban runoff. (Loustau-FIRL)
W76-05576

LIME-INDUCED REACTIONS IN MUNICIPA WASTEWATERS,
Colorado Univ., Boulder. Dept. of Civil and E vironmental Engineering.
For primary bibliographic entry see Field 5D.
W76-05597

INTERACTIONS OF MERCURY WI AQUATIC AND EDAPHIC ENVIRONMENTS,
Kansas State Univ., Manhattan. Dept. of Agron my.
D. W. Newton, R. Ellis, Jr., and G. W. Paulsen.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-251 06 $4.50 in paper copy, $2.25 in microfiche. Kans Water Resources Research Institute, Manhatta Contribution Number 136. 64 p, 11 fig, 11 tab, ref. OWRT B-027-KAN(2). 14-31-0001-3591.

Descriptors: *Heavy metals, *Clays, *Adsorptio *Mercury, Soils, Salts, Chlorides, Pollut identification, Radioisotopes, Bentonite.
Identifiers: *Desorption, *Salt effects, Mercu loss, Mercury vaporization.

Reactions of Hg with bentonite clay were studi to determine behavior of the metal in aqua ecosystems. Mercury (II) adsorption by benton as a function of pH and complex formation was vestigated using a radio-isotopic technique. Ma imum Hg(II) adsorption in 0.01 M Ca(NO systems occurred in the pH range 4.5-5.5. Vary the Ca(NO3)2 concentration only slightly fluenced adsorption or the pH of maximum sorption. Chloride ions sharply reduced Hg(II) sorption, especially at low pH's. At pH 6 or low increasing CaCl2 concentration from 10-5 to 1 M depressed adsorption; higher CaCl2 levels w required to decrease adsorption at pH 7. At a giv Cl concentration, maximum Hg(II) adsorption curred near the pH where HgClOH occurred a transition complex between HgCl2 and Hg(OH Chloride salts (0.01 M CaCl2, NaCl, and K were more effective desorbers of Hg(II) than w 0.01 M Ca(NO3)2 or various 0.01 N acids. H (0.01 N) removed the most adsorbed Hg(II). Lo of mercury (II) from dilute solutions was studi using 203Hg(II) as a tracer. Magnitude and rate loss depend on Hg(II) concentration, chemi composition of carrier solutions, and contai material. Losses were severe only at Hg(II) c centrations of 10-6 M (0.2 ppm) or lower. Of Hg-containing solutions studied, loss was great from 0.01 M CaCl2; Hg (II) was stable at all lev in the concentrated HNO3. Increasing pH fro to 8 appeared to reduce Hg loss. Adding KMn also reduced losses. Glass and plastic contain differ in their ability to retain Hg(II) in solution. W76-05601

STATISTICAL STUDY OF THE DUCKWE RHIZOSPHERE AS AN ECO-ASSAY TOOL,
Massachusetts Univ., Waltham. Dept. of Envir mental Sciences.
R. A. Coler.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-251 1 $3.50 in paper copy, $2.25 in microfiche. M sachusetts Water Resources Research Cen Amherst, Completion Report, September, 1974 p, 2 tab. OWRT A-049-MASS(1).

Descriptors: *Rhizosphere, *Statistical studi Monitoring, *Bioassay, *Bioindicato Cyanophyta, Water quality, Plant communities.

ntifiers: *Duckweed, Aphids, *Lemna, scillatoria, Rhopalosiphum nymphaeae.

o potentially restrictive components of the mna environment were introduced and mea- ed: (1) predation, by Lebistes reticulatus (the py) which limits biomass directly by consump- n, and (2) Oscillatoria, a blue-green alga which rts an impact both directly through competition the aquatic milieu, and indirectly through ruption of plant metabolism by the liberation of lotoxin. Insights into the interaction of en- genous stresses were afforded by the sustained servation of a duckweed culture infected with ids (Rhopalosiphum nymphaeae). The in- tigations illustrate that in predator-prey rela- nships as reflected in diversity, it is not possible distinguish between exogenous and endogenous ss. The application of resident plant communi- to water quality monitoring appears plausible he communities are first permitted to stabilize. e study has also served as the calibration phase a more rigorous effort in which other river nts could be studied and their response to stress asured by application of a community diversity ex (Shannon-Wiener).
6-05605

ACE ELEMENT, MINERALOGY, AND SIZE STRIBUTION OF SUSPENDED MATERIAL MPLES FROM SELECTED RIVERS IN STERN KANSAS,
nsas Univ., Lawrence. Dept. of Geology.
E. Angino, and H. Schneider.
ailable from the National Technical Informa- n Service, Springfield, Va 22161 as PB-251 164, 50 in paper copy, $2.25 in microfiche. OWRT 059-KAN(1), 14-31-0001-3816, Kansas Water sources Research Institute, Lawrence, KWRRI ntribution No. 169, September 1975, 58 p, 3 fig, tab, 38 ref, 4 append.

scriptors: *Trace elements, *Mineralogy, ers, *Kansas, *Metals, Suspended solids, od stages, *Distribution, *Turbidity, diments, Zinc, Copper, Nickel, Iron, Cobalt, nganese, *Path of pollutants, Pollutant identifi- ion.
ntifiers: Suspended material, Size distribution, tle Creek Reservoir(Kan).

e major purpose was to examine the mineralogy the concentrations and locations of trace tals (Zn, Cu, Ni, Fe, Mn, Co) in suspended terial transported by eastern Kansas rivers dur- flood stage. The mineralogical properties of and high flood stage samples are similar. Most mples contained illite, interlayered material with ntmorillonitic and vermiculitic layers, mixed er material, koalinite, quartz, and feldspar. rmiculite is of significance in rivers draining the ciated areas of Kansas but is not statistically nificant elsewhere. The size distribution data similar for all rivers studied with large percent- s of clay-size material being added to Tuttle ek Reservoir. This is a major contributing fac- to the consistent turbidity problem in this rvoir. There are many errors involved in col- ing, dividing, and dissolving sediment into eous fractions and analyzing these fractions. relations were noted between size data, eralogy, and the trace element content of the ples.
5-05606

NTROL OF NITROGEN TRANSFORMA- NS IN SOILS,
a State Univ., Ames.
. Bremner.
ilable from the National Technical Informa- Service, Springfield, Va 22161 as PB-251 381, 0 in paper copy, $2.25 in microfiche. OWRT 11-IA(1), 14-31-0001-3515, -3815, -4015, Iowa er Resources Research Institute, Ames npletion Report ISWRRI-61, June 1974. 95 p, f, 1 append.

Descriptors: *Water pollution sources, *Nitrogen compounds, *Fertilizers, Nitrates, Nitrites, Nitrification, Inhibitors, Nitrogen, Nitrogen fixation, Agriculture, Soils, Ammonia, Ureas, Eutrophication, Laboratory tests, Water pollution.
Identifiers: *Urease inhibitors.

World consumption of fertilizer nitrogen has increased at a phenomenal rate since World War II. This trend will result in increased levels of nitrogen in soils, natural waters, crop residues, and municipal and agricultural wastes. The effectiveness of 24 compounds proposed as inhibitors of nitrification in soils was studied by determining the effects of each compound on the amounts of nitrate and nitrite produced when soils treated with ammonium sulfate were incubated at 30C for 14 days. The work performed indicates that N-Serve, 2-chloro-6-(trichloromethyl)-pyridine, is the most effective of the compounds thus far proposed for inhibition of nitrification in soils. The manufacturers of this compound have performed a variety of tests indicating that there is little, if any, risk of adverse effects associated with the use of N-Serve to retard nitrification in soils and reduce nitrate enrichment of water resources. This conclusion was supported. An appendix included the results of the research conducted as reported in eight journal articles and one dissertation. (See also W74-10334, W74-06349, and W74-03523) (Sims - ISWS)
W76-05608

PINE MANAGEMENT INFLUENCES THE SOUTHERN WATER RESOURCE,
Forest Service (USDA). Southern Forest Experiment Station.
S. J. Ursic.
In: Proceedings, Symposium on Management of Young Pines, p. 42-48. 1974. 22 refs. Southeastern Area, State and Private Forestry and Southern and Southeastern Forest Experiment Stations.

Descriptors: *Water yield, *Streamflow, *Water quality, *Sediment yield, *Coastal Plains, *Gulf Coastal Plain, Watershed management, Interception, Loblolly pine trees, Water resources, Groundwater recharge, Overland flow, Forest management, Pine trees, Water quality standards, Mississippi.
Identifiers: Site preparation, Sediment production, Water quality legislation.

Activities required to meet the anticipated demand for southern pine products in the next 25 years may temporarily impair water quality and significantly reduce streamflow and groundwater recharge. However, management practices can probably ameliorate such changes. The information needed to establish realistic water quality standards for southern forests is not available. (Forest Service)
W76-05616

THE IMPACT OF TIMBER HARVEST, FERTILIZATION, AND HERBICIDE TREATMENT ON STREAMWATER QUALITY IN WESTERN OREGON AND WASHINGTON,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
R. L. Fredriksen, D. G. Moore, and L. A. Norris.
In: Forest Soils and Forest Land Management, Proceedings of the Fourth North American Forest Soils Conference, August 1973. p. 283-313, 1975. 7 fig, 10 tab, 49 ref. Bernier, B., and Winget, C. H. (eds.).

Descriptors: *Lumbering, *Water quality, *Herbicides, *Fertilizers, *Nutrients, Forest management, Soil erosion, Sedimentation, Water pollution sources, Nitrogen, *Oregon, *Washington.

Sedimentation of forest streams after timber harvest increases exponentially with increasing angle of slope in three experimental watersheds in western Oregon. Forest roads that crossed steeply inclined stream channels caused much greater levels of sedimentation than roads on ridge tops. More time was required for soils to stabilize from clearcutting and forest roads in the steeper country. In very steep topography, where soil strength is nearly in balance with the potential for downsliding, the largest sedimentation increases are expected as a result of frequent mass erosion events. Nutrients are lost following clearcutting, but the loss decreases rapidly with revegetation. Maximum NO3-N concentration increases in streams have remained well below toxic levels. Nutrient losses by soil erosion are undoubtedly of greater importance on steeper slopes. Forest fertilization-water quality studies indicate that N concentration in streams does not increase to levels exceeding published standards. Total loss of applied nutrient is small and should not have any measurable impact on eutrophication in downstream impoundments. The drift or direct application of spray materials to surface waters is the principal route of herbicide entry to streams. Overland flow and leaching of herbicide are relatively unimportant factors in forest stream pollution. Carefully controlled herbicide applications are not expected to have a significant impact on forest stream quality. (Forest Service)
W76-05618

NUTRIENT CYCLING IN 37- AND 450-YEAR-OLD DOUGLAS-FIR ECOSYSTEMS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
C. C. Grier, D. W. Cole, C. T. Dyrness, and R. L. Fredriksen.
In: Integrated Research in the Coniferous Forest Biome, Bull. No. 5, Coniferous Forest Biome, Ecosystem Analytical Studies. US/IBP. p. 21-34. 1974. 5 tab, 28 ref. Waring, R.H., and Edmonds, R.L. (eds.).

Descriptors: Water pollution sources, *Cycling nutrients, Forests, *Model studies, Ecosystems, *Coniferous forests, *Douglas fir trees, Pacific Northwest US, *Biomass, Nitrogen, Phosphorus, Potassium, Calcium, Growth rates, *Pollutant identification, *Path of pollutants.
Identifiers: Coniferous forest ecosystems.

Biomass and nitrogen, phosphorus, potassium, and calcium distribution, and biogeochemical and stand nitrogen, phosphorus, potassium, and calcium budgets were determined for 37- and 450-year-old Pseudotsuga menziesii (Mirb.) Franco stands in the U. S. Pacific Northwest. Biomass of the 450-year-old stand is greater, but annual growth is less than that of the 37-year-old stand. About 50% of the annual growth and over 50% of the nutrient uptake and return in the 450-year-old stand occurs in subordinate vegetation compared with less than 15% in the 37-year-old stand. Chemical differences in soil parent material between the two stands are reflected in both the biogeochemical and stand nutrient cycles. (Forest Service)
W76-05619

RELATIONSHIPS BETWEEN DRAINAGE AREA CHARACTERISTICS AND NON-POINT SOURCE NUTRIENTS IN STREAMS.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-240 619 $4.50 in paper copy, $2.25 in microfiche. Working Paper No 25, August 1974. 54 p, 11 fig, 7 tab, 23 ref.

Descriptors: *Land use, *Drainage area, *Nutrients, *Streams, Watersheds(Basins), Runoff, Eutrophication, Surveys, Agricultural watersheds, Forest watersheds, Nitrogen compounds, Phosphorus compounds, Soils, Topography, Climates, Geographical regions, Forecasting, Regression analysis, Hydrogen ion concentration, Livestock, Data collections, Farm wastes,

Maine, New Hampshire, Vermont, Massachusettes, Connecticut, New York, Michigan, Wisconsin, Minnesota.
Identifiers: *Non-point nutrient sources, National Eutrophication Survey.

Land use and stream nutrient-runoff data from 143 stream drainage areas in north-central and northeastern U.S. related only to non-point sources were studied the first year of the National Eutrophication Survey. Mean annual nutrient concentrations were higher in streams draining agricultural lands than in streams draining forested watersheds. Total nitrogen concentrations and stream loadings varied less than total phosphorus concentrations and loadings. Little correlation was found between nutrient export and overall land use. Soil, topography, and climate analyses and positive correlations between flow and percent forest suggested dilution of nutrient export-land use correlations. Regression analyses of total phosphorus and nitrogen against percent forest drainage areas indicated a significant relationship but better predictability was attained by identifying data points by geographic region and computing separate logarithmic regressions. Scatter diagrams and regression lines indicate that predictability for nitrogen (as opposed to phosphorus) was due more to forest relationship than geographic region. Livestock density affected both nitrogen and phosphorus in stream concentrations. Preliminary nutrient concentration prediction models were constructed for nitrogen and phosphorus but the inclusion of slope, soils, climate, etc., should increase their utility. Soil pH and stream nutrients showed significant correlations; concentrations were generally higher in streams draining soils high in bases rather than acidic soils. (Buchanan-Davidson--Wisconsin)
W76-05624

APPLICATION OF FACTORIAL ANALYSIS OF PRINCIPAL COMPONENTS TO THE CONTROL OF POLLUTION OF SURFACE WATERS,
Institut National de la Sante et (de) la Recherche Medicale, Paris (France).
H. Veiga-Pires, F. Derriennic, A. Leclerc, G. Martin-Bouyer, and F. Roger.
Rev Int Oceanogr Med 39/40, p 11-32, 1975.

Descriptors: Water pollution control, Surface waters, Oysters, Shellfish, E coli, Streptococeus, Bacteria, Breeding, Nitrates.
Identifiers: Factorial analysis.

The cases of water pollution in the sites of oyster breeding bring a quick expansion of the data, due to the increase of sampled sites and of the parameters that characterize the water. An overall 258 samples were collected. For each, 3 bacy e were retained, i.e., coliforms, Escherichia coli and Streptococcus faecalis, while the physico-chemical parameters of temperature, pH, salinity, nitrates, organic substances, dissolved O2 and BOD5 (biochemical O2 demand) were measured. Due to the existence of quantitative variables and qualitative variables (nitrates), two statistical methods were used. An attempt was made to synthesize the overall estimate of the 258 samples through the factor analysis of the data into principal components. A split-up analysis was done on each of the 3 bacteria, in order to determine which parameter(s) should be chosen to break down the samples into 2 sub-groups.--Copyright 1975, Biological Abstracts, Inc.
W76-05632

A STOCHASTIC MODEL OF DISPERSION OF SEDIMENT PARTICLES RELEASED FROM A CONTINUOUS SOURCE,
Montreal Univ. (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 2J.
W76-05663

VERTICAL DISTRIBUTION OF NITRATE CONCENTRATION IN INTERSTITIAL WATER OF MARINE SEDIMENTS WITH NITRIFICATION AND DENITRIFICATION,
Brussels Univ. (Belgium). Industrial Chemistry Inst.
J-P. Vanderborght, and G. Billen.
Limnology and Oceanography, Vol. 20, No. 6, p 953-961, November 1975. 7 fig, 22 ref.

Descriptors: *Nitrification, *Denitrification, *Nitrates, *Nitrites, *Mathematical models, Diffusion, Sedimentation, Connate water, Sediments, Marine biology, Sediment-water interfaces, *Path of pollutants, Water pollution sources.
Identifiers: *Vertical profiles, Nitrogen transfer, Ostend(Belgium).

Vertical concentration profiles of nitrate and nitrite in interstitial water of sediment in the Sluice Dock at Ostend (Belgium) commonly show a maximum in nitrate concentration at a few centimeters depth where sediments are sandy and poor in organic matter, while in muddy and organic-rich sediments, nitrate is lower in interstitial water than in the overlying water and decreases rapidly with depth. Direct measurements of the activity of autotrophic nitrifying bacteria in the sediments showed nitrification in the upper few centimeters of sandy sediments but not in muddy sediments. A mathematical model was proposed to analyze quantitatively these experimental results, taking into account nitrification, denitrification, diffusion, and sedimentation. Seasonal variations of nitrate concentration in overlying water are slow enough to justify the use of a stationary (steady state) model. When appropriate values were used for the parameters (rate of nitrification, depth of the sedimentary layer in which nitrification occurs, rate of denitrification, diffusion coefficient), some being experimentally determined, the model predicted concentration profiles in good agreement with experimental data. (Lardner-ISWS)
W76-05678

MOVEMENT OF TRACERS THROUGH SOIL,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
M. Brandes, H. T. Chan, and W. W. Cheng.
Ontario Ministry of the Environment, Research Report No. S55, 1975. 34 p, 6 fig, 14 ref, 3 tab.

Descriptors: *Tracers, *Groundwater movement, *Tritium, Radioisotopes, Dyes, Soils, Soil water movement, Sands, Clay loam, Groundwater, *Path of pollutants.
Identifiers: Fluorescein.

Tracers are needed to follow the movement of groundwaters, especially those into which contaminants may have been introduced by subsurface discharge of effluents. Results of tracer studies indicate that tritium is an excellent label but requires special care and approval by atomic energy agencies, owing to its radioactivity. Fluorescein is an acceptable dye tracer in sand but not in clay or silt soils. (Brown-IPC)
W76-05701

RAPID PHOTOCHEMICAL DECOMPOSITION OF ORGANIC MERCURY COMPOUNDS IN NATURAL WATER,
Philips Gloeilampenfabrieken N.V., Eindhoven (Netherlands). Forschungslaboratorium.
For primary bibliographic entry see Field 5A.
W76-05715

ENVIRONMENTAL ASPECTS OF THE USE OF STARCHES IN THE PAPER INDUSTRY (HLEDISKA OCHRANY ZIVOTNIHO PROSTREDI PRI POUZIVANI SKROBOVYCH PRODUKTU V PAPIRENSKEM PRUMYSLU),
P. G. Soutjesdijk, and G. Smit.
Papir a Celuloza, Vol. 30, No. 11, p 245-248, 255, 1975. 6 fig, 2 tab.

Descriptors: *Carbohydrates, *Water pollutio sources, *Pulp and paper industry, Water pollu tion control, Wastes, *Industrial wastes Suspended solids, Dispersion, Cations, Anions Hydrogen ion concentration, Economics Biochemical oxygen demand, Chemical oxyge demand.
Identifiers: *Starch, Starch derivatives, Coate paper, Waste paper, Broke(Paper machine waste White water(Paper machine), Sizing agents.

Starch-based materials in the paper industry a used for tensile strength improvement, surface siz ing, and coating of paper. Because of water pollu tion, the presence of starch in paper mill effluent undesirable. Because of its dispersing ability starch also hinders the separation of suspende solids from the effluent in the primary treatmer stage. In order to minimize the escape of starch i the effluent, the retention of starch in the pape web has to be enhanced by cationization o anionization. Cationic starches used in pulp stoc for strength improvement contain tertiary or qua ternary ammonium groups. Starches with tertiar ammonium groups are not usable at a pH high 4.5, while those with quarternary ammoniu groups work well up to pH 9. To avoid the increas in white water starch content caused by the retur of surface-sized broke, the degraded starches use on the size press should also be cationized o anionized. Phosphoric esters of starches used as coating component are generally well fixed o fibers and are not solubilized during coating brok repulping. The economical advantages of cation and anionic starches in comparison with th nonionic native starch are stressed. The BOD an COD values for various starch products used papermaking are given. (Trubacek-IPC)
W76-05720

WATER POLLUTION IN CONNECTION WIT BARK DUMPING (VATTENFORORENINGAR SAMBAND MED BARKDEPONERING),
Swedish Cellulose Co., Sundsvall.
M. Zackrisson.
Vatten, Vol. 30, No. 4, p 390-393, 1974. 1 fig, 5 re 2 tab.

Descriptors: *Bark, *Solid wastes, *Was disposal, *Water pollution, Biochemical oxyg demand, Acids, Salts, Organic acids, Drainag water, Recirculated water, Water pollutio sources, Wastes, Industrial wastes, Wood wastes
Identifiers: Acetic acid, Propionic acid, Butyr acid.

A bark dumping operation was studied wi respect to the amount of pollution in the drainag water. The 7-day BOD discharge was 200-5 kg/day. Acetic, propionic, and butyric acids an their salts were the main organic components di solved in the water. The results may have been i fluenced by the fact that the drainage water wa recirculated the year prior to the investigatio (Speckhard-IPC)
W76-05726

CHEMICAL CHARACTERIZATION OF FIBE BUILDING BOARD MILL EFFLUENT,
Swedish Forest Products Research Lab Stockholm.
For primary bibliographic entry see Field 5A.
W76-05731

SILVER IN PHOTOPROCESSING EFFLUENTS
Eastman Kodak Co., Rochester, N. Y.
For primary bibliographic entry see Field 5D.
W76-05732

TRANSFER OF LINDANE FROM BARK OF I SECTICIDE-SPRAYED PINE PULPWOOD INT EFFLUENT FROM A BARKING DRU (LINDAANIN HUUHTOUTUMISEST SUOJARUISKUTETUN MANTYKUITUPUU

KUORESTA RUMPUKUORIMON ATEVETEEN),
Finnish Forest Research Inst., Helsinki.
K. Loyttyniemi.
Paperi ja Puu (Papper och Tra), Vol. 57, No. 10, p 666-668, Oct., 1975. 10 ref, 2 tab. English summary.

Descriptors: *Bark, *Water pollution sources, Insecticides, Wood waste, Pollutants, Wastes, Water pollution, *Industrial wastes, Chlorinated hydrocarbon pesticides, Foreign research, Foreign countries, Legislation.
Identifiers: Lindane(Gamma-isomer of HCH), Barking effluent, Finland, Pulpwood, Hexachlorocyclohexane(Benzene hexachloride BHC HCH).

Unbarked green pine pulpwood logs were sprayed with 1.1 liter of lindane (0.4% gamma-HCH) per solid cu m in the spring of 1974 and barked in a drum barker 2 months later. The lindane level in the bark averaged 11 mg/kg of dry matter before barking and less than one-half of this after barking. In the waste water the lindane concentration was 0.06-0.10 mg/liter. According to Finnish environmental legislation, insecticide-sprayed wood must not be barked in a wet (hydraulic) drum barker if there is any probability of the effluent entering natural waterways. (Brown-IPC).
W76-05734

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VOL. II,
ITN, Inc., Orlando, Fla.
For primary bibliographic entry see Field 5G.
W76-05744

IMPACT OF COAL STRIP MINING ON WATER QUALITY AND HYDROLOGY OF EAST TENNESSEE,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
T. Tschantz, and A. Minear.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 391, $5.50 in paper copy, $2.25 in microfiche. OWRT A-041-Tenn. (1) 14-31-0001-5043 Tennessee Water Resources Research Center, Knoxville, Report No. 47, November 30, 1975. 46 p, 19 fig, 5 tab, 16 ref.

Descriptors: Water quality, Hydrology, Strip mining, *Monitoring, *Heavy metals, *Coal mine wastes, *Strip mine wastes, Mine drainage, Tennessee, Watersheds(Basins), *Path of pollutants, Pollutant identification.
Identifiers: New River Basin(Tenn).

Nine small watersheds (0.7 to 4.9 sq.mi.) within the New River Basin of the Northern Tennessee Cumberland Mountains have been monitored weekly and simultaneously for water quality between January and September, 1975. Three watersheds were undisturbed by mining activity and served to establish bench mark data. The other three watersheds represented varying stages of coal mining in one watershed to essentially complete stripping three years ago and current deep mining activity in another. Distinct differences are observed were the variables, pH, alkalinity, sulfate, calcium, magnesium, iron manganeses, total solids and suspended solids among the disturbed watersheds in contrast to the undisturbed watershed where stream constituent concentrations were quite uniform from stream to stream and from sample to sample. Preliminary data on heavy metals, Cd, Cr, Co, Cu, Pb, Ni and Zn, indicate increased metal levels in the disturbed streams, principally in particulate form.
W76-05833

MODELING THE EFFECT OF WASTE DISCHARGES IN A SMALL MOUNTAIN STREAM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
R. C. Hoehn, M. R. Childney, and D. N. Contractor.
Available from the National Technical Information Service Springfield, Va 22161 as PB-251 392, $5.00 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 76, September 1975. 94 p, 21 fig, 5 tab, 14 ref, 4 append.

Descriptors: *Computer Models, *Dissolved Oxygen, *Biological Oxygen Demand, Streams, Mountains, Computers, Model studies, *Virginia, *Forecasting, *Path of pollutants, Water pollution sources.
Identifiers: Sensitivity Analysis, Computer Prediction.

This research evaluated the applicability of a particular computer model, designed to predict dissolved oxygen (DO) and biochemical oxygen demand (BOD) concentrations in rivers, to similar studies of a small mountain stream in southwestern Virginia. The river model was developed by Virginia State Water Control Board's Bureau of Water Control Management. A detailed explanation of the necessary computations involved, the methods used to obtain all necessary input data, and modifications that were made in the original model to adapt it for use with a small stream. Also included is a discussion of a modified sensitivity analysis of the model performed to identify which input parameters, if varied slightly, would affect the model's DO and BOD predictions. Finally, data are presented showing that the modified version of the model is capable of predicting measured DO and BOD concentrations in the stream.
W76-05834

SALT TRANSPORT IN SOIL PROFILES WITH APPLICATION TO IRRIGATION RETURN FLOW, THE DISSOLUTION AND TRANSPORT OF GYPSUM IN SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
T. K. Glas, and D. B. McWhorter.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 373, $5.50 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 71, January 1976. 88 p, 31 fig, 9 tab, 49 ref. OWRT A-017-COLO(1).

Descriptors: *Leaching, Water quality, Percolation, Equations, Dispersion, Convection, Salts, *Soil profiles, *Return flow, Irrigation, *Gypsum, Calcium sulfate, Soil water movement, Kinetics, Model studies, Dissolved solids.
Identifiers: *Salt transport, Salt removal.

The dissolution of gypsum and the subsequent transport of the dissolved species in a soil-water system was studied by measuring the calcium concentration in the solution phase as a function of time at different positions in columns filled with a soil-gypsum mixture that were leached with distilled water. Two soils, a range of flow rates of the solution phase, solution contents and particle sizes of the gypsum material were used. The measured concentration-time curves were compared with results from a mixing cell-equilibrium chemical model, and the convection-dispersion equation combined with a first-order kinetic rate equation to describe the gypsum dissolution process. The rate equation was based on the hypothesis that the rate of dissolution was proportional to the product of the saturation deficit and a function of the mass of gypsum present in the system. Values of the kinetic parameters were selected to obtain the best possible agreement between the measured concentration-time curves and concentration-time curves calculated from the kinetic model. The dissolution reaction of the gypsum was time dependent and was not controlled by the solubility product relationship, as assumed in the mixing cell model.
W76-05836

SOME OF THE EFFECTS OF DOMESTIC SEWAGE DISCHARGE INTO HICKMAN AND JESSAMINE CREEKS IN JESSAMINE COUNTY, KENTUCKY,
Asbury Coll., Wilmore, Ky.
H. H. Howell, and M. W. Jones.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 378, $4.00 in paper copy, $2.25 in microfiche. OWRT A-999-Ky (3) 14-34-0001-6018 Kentucky Water Resources Research Institute, Lexington, Research Report No. 93, February, 1976. 26 p, 2 fig, 6 tab, 22 ref.

Descriptors: Water pollution, Streams, Benthos, Benthos, Fish, *Kentucky, Sewage, Domestic wastes, Waste disposal, Sewage disposal, Treatment facilities, Phosphates, Sulfates, Nitrates, Bioindicators, Path of pollutants.
Identifiers: Stream order, Hickman Creek(Ky), Jessamine Creek(Ky).

A six-week study was made in the summer of 1971 as an initial effort to determine the extent of pollution that the three sewage disposal plants in Jessamine County, Kentucky, are contributing to its streams. With the rapid population increase in Lexington and nearby municipalities, this study should furnish a basis of comparison for future investigations. Eighteen collecting stations were established in riffle areas of Hickman and Jessamine Creeks, and coliform bacteria, macro-invertebrate populations, fish populations and chemical water quality of each riffle area were studied. Hickman Creek's flow was augmented by approximately 3,100,000 gallon/day (11,735 m3/day) from one of the City of Lexington's sewage disposal plants, and Jessamine Creek's flow by 500,000 gallons/day (1,893 m3/day) from the cities of Nicholasville and Wilmore. The Lexington and Wilmore facilities were greatly overloaded. Chemical analysis were directed toward finding out fluctuations of phosphates, sulfates, and nitrates. Water disappearing through limestone faults posed investigational problems. Hickman Creek showed evidences of pollution for a greater distance than did Jessamine. Diversity of clean water indicator organisms was higher in lower Jessamine than in lower Hickman; this was particularly true for darters and stoneflies. (Huffsey-Kentucky)
W76-05841

STEADY-STATE SEGMENTED DISSOLVED-OXYGEN MODEL,
Geological Survey, Bay Saint Louis, Miss.
D. P. Bauer, and M. E. Jennings.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 779, $5.50 in paper copy, $2.25 in microfiche. Computer Contribution Report USGS/WRD-75/027, May 1975. 96 p, 2 fig, 5 ref.

Descriptors: *Mathematical models, *Oxygen sag, *Path of pollutants, *Wastes, *Streams, Computer models, *Computer programs, Synthetic hydrology, Numerical analysis, Methodology, Biological properties, Chemical properties, *Dissolved oxygen, Biochemical oxygen demand, Forecasting, Anaerobic conditions.
Identifiers: Streeter-Phelps, One-dimensional, Bell method, Linear runoff.

A digital model which predicts stream biochemical characteristics from waste source inputs is described. The program is developed using the basic Streeter-Phelps equation. This formulation assumes a one-dimensional system and constant stream and waste flows. Variables which are predicted include dissolved oxygen, biochemical oxygen demand, and various conservative minerals. In modeling a stream reach, the program user can break the reach into as many subreaches as desired. Summary results from the model are broken into tabulations at fixed distance intervals downstream. For given subreaches the user is allowed to specify waste or tributary inflow at the

start of the subreach and (or) linear runoff along the subreach. Output from the program is also modified by the addition of line-printer plots and expanded line-printer output tabulations. Editing of the input data is also included. (Woodard-USGS)
W76-05855

HYDROGEOCHEMICAL DATA FROM INVESTIGATION OF WATER QUALITY IN SEWERED AND UNSEWERED AREAS, SOUTHERN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 7C.
W76-05858

COMPILATION OF METHODOLOGY USED FOR MEASURING POLLUTION PARAMETERS OF SANITARY LANDFILL LEACHATE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-05869

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT - ECOLOGY, JANUARY-DECEMBER 1974.
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05879

ROLE OF COPEPOD FECAL PELLETS IN THE VERTICAL TRANSPORT OF FRESHWATER DIATOMS,
Argonne National Lab., Ill. Radioological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05880

VERTICAL TRANSPORT OF PARTICULATE MATERIAL IN LAKE MICHIGAN BY THE LORICA OF CODONELLA CRATERA,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05881

DISTRIBUTION OF DIATOM FRUSTULES IN LAKE MICHIGAN SEDIMENT CORES,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05882

DISTRIBUTION OF AMORPHOUS, DIATOM FRUSTULE, AND DISSOLVED SILICA IN A LEAD-210 DATED CORE FROM SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05883

STABLE LEAD GEOCHRONOLOGY OF FINE-GRAINED SEDIMENTS IN SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
J. A. Robbins, and D. N. Edgington.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 32-39, (1975). 4 fig, 1 tab, 13 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Lead, Sediments, *Cores, Air pollution, Distribution, Aerosols, Coals, Gasoline, Lake Michigan, Model studies, *Lake sediments, Lakes. Identifiers: *Geochronology, Combustion, Cultural lead.

The lead distributions in dated cores are quantitatively described by a universal time-dependent loading or source function which is a linear combination of estimated annual inputs of atmospheric lead derived from the combustion of leaded gasoline and the burning of coal in and around Chicago since about 1800. A source function model which assumes that lead has a negligible residence time in water and negligible postdepositional chemical or diffusional mobility was derived. It was also assumed that atmospheric inputs were the major source of cultural lead in the sediments and that other sources were proportional to the atmospheric inputs. The model-derived parameters of sedimentation rate, mixing depth, and 1972 cultural lead were applied to study Illinois Geological Survey cores from southern Lake Michigan. (See also W76-05879) (Chilton-ORNL)
W76-05884

GEOCHRONOLOGY OF LAKE MICHIGAN SEDIMENTS: ANOMALIES IN LEAD-210 DISTRIBUTIONS,
Michigan Univ., Ann Arbor.
J. A. Robbins, D. N. Edgington, J. Gustinis, and J. O. Karttunen.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 40-50, (1975). 3 fig, 1 tab, 8 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Lead, *Distribution, Sediments, Cores, Lake Michigan, *Lake sediments, Lakes.
Identifiers: *Geochronology.

Measurements of Pb210 and Cs137 and stable lead were made on a series of 10 cores. In nearly every core, significant subsurface anomalies occur, showing that nonexponential and presently uninterpretable features are the rule rather than the exception in fine-grained sediments from southern Lake Michigan. It is suggested that the anomalies are the result of some event common to at least several of the Great Lakes. Regional causes such as major storms, floods, droughts, changes in lake levels, or changing land use may influence inputs of terrigenous materials to the lake. Changes in the depth of a surficial mixing zone due to bioturbation or the structure of bottom currents could produce anomalies. It was concluded that studies of the behavior of lead in lacustrine environments should include delineation of sources of lead and sediments and their spatial and temporal variations, spatial variation of anomalies over the lake bottom, and chemical mobility of lead in the sediments. (See also W76-05879) (Chilton-ORNL)
W76-05885

MIAMI RIVER WATERSHED PROJECT: INTRODUCTION,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
R. N. Muller, D. G. Sprugel, and D. N. Edgington.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 69-71, (1975). W-31-109-Eng-38.

Descriptors: *Watersheds(Basins), Physical properties, *Ohio, *Plutonium, Environmental effects, Projects, *Path of pollutants, Radioisotopes.
Identifiers: *Miami River Watershed Project(Ohio).

The project was designed to study cycling characteristics of plutonium in the humid eastern portions of the United States. The watershed, located in southwestern Ohio, encompasses about 5400 square miles. Daily mean temperatures range from 2 degrees C to 25 degrees C. Annual precipitation averages 90 cm. Land use is predominantly agricultural with an extensive industrial base between Dayton and Cincinnati. The topography is gently rolling and formed from a thick mantle of glacial till underlain by limestone, dolomite, and calcareous shale. The soil is generally silt loam with moderately good drainage and a pH ranging from neutral to slightly acid. Three primary isotopes of plutonium, Pu238, Pu239, and Pu240, are present in the watershed but the levels of these isotopes in the environment are so low that study of their cycling characteristics is difficult. (See also W76-05879) (Chilton-ORNL)
W76-05886

PLUTONIUM CONCENTRATIONS IN WATER AND SUSPENDED SEDIMENT FROM THE MIAMI RIVER WATERSHED, OHIO,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
G. E. Bartelt, C. W. Wayman, and D. N. Edgington.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 72-77, (1975). 3 tab, 5 ref. W-31-109-Eng-38.

Descriptors: *Watershed(Basins), *Plutonium, *Radioisotopes, *Ohio, Sediments.
Identifiers: *Miami River Watershed Project(Ohio).

The primary goals were to identify sources and sinks of plutonium in the Miami River Watershed and to determine spatial and temporal variability in concentrations of the different plutonium isotopes. The major source of Pu238 is the direct discharge to the Miami River from the sanitary water treatment plant at Mound Laboratory. Significant concentrations may also result from the erosion of Pu238 enriched sediment from contaminated ponds and canal area near Mound and from fallout from the laboratory's stacks with subsequent erosion and runoff into the river. Concentrations of Pu238, Pu239, and Pu240 increased greatly during rainy periods. This increase was probably due to surface erosion of soil containing Pu and subsequent loading of the streams with sediment. (See also W76-05879) (Chilton-ORNL)
W76-05887

PLUTONIUM IN AQUATIC BIOTA OF THE GREAT MIAMI RIVER WATERSHED, OHIO,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05888

THE CHEMICAL SPECIATION OF PU-239, PU-240 AND CS-137 IN LAKE MICHIGAN WATERS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
J. J. Alberts, M. A. Wahlgren, P. J. Jehn, D. M. Nelson, and K. A. Orlandini.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 89-96, (1975) 2 tab, 4 ref. W-31-109-Eng-38.

Descriptors: *Plutonium, *Cesium, Chemistry, *Water pollution, *Radioisotopes, Fallout, Particle size, Lake Michigan, Lakes, Distribution.

Studies of the submicron size distribution and charge characteristics of naturally occurring levels of Pu239, Pu240 and Cs137 were undertaken to help define the physicochemical state of these fallout derived nuclides in Lake Michigan waters and in precipitation samples taken in the Argonne Laboratory area. The work indicates that the radioisotopes exist in several different fractions within the water column and that the total charge of these fractions is different from what would be predicted by simple solution chemistry. The distribution of these isotopes in snow is different

om that in the water column, indicating that con-
derable chemical and/or physical transforma-
ns must take place after the atmospheric input
s reached the lake surface. Insufficient data
re available to determine rate constants for the
ocesses or to give quantitative values for the in-
vidual fractions present in the waters. Work is
ntinuing on these problems. (See also W76-
879) (Chilton-ORNL)
76-05889

DIMENTARY PU-239, PU-240 PHASE DIS-
IBUTIONS IN LAKE MICHIGAN SEDI-
ENTS,
gonne National Lab., Argonne, Ill. Radiological
d Environmental Research Div.
. Alberts, M. A. Wahlgren, C. A. Reeve, and P.
ehn.
Radiological and Environmental Research
vision Annual Report-Ecology, January through
cember 1974, p 103-112, (1975). 1 fig, 2 tab, 8
W-31-109-Eng-38.

scriptors: *Plutonium, Environment, Sedi-
nts, Deposition(Sediments), Chemistry,
spension, *Radioisotopes, Lake Michigan, Lim-
ogy, *Lake sediments, Lakes, *Distribution.
ntifiers: Cycling, Nuclear studies.

e purpose was to better understand the cycling
fate of plutonium isotopes in the natural en-
nment, with the goal of forming a predictive
del for a hypothetical accident involving
lear materials. Sediment grab samples were ob-
ed along a transect starting in the Grand River
chigan) and extending into deep water of Lake
higan. The sediments were then subjected to a
es of extractions designed to differentiate
erial which exists in the ion exchangeable,
uctant-soluble, organic, and crystalline phases
hin the sediment. Concentrations of Pu 239, 240
e low in all samples. The study indicated that
239, 240 in Lake Michigan is relatively immo-
and that essentially none is in the form of
actory particles. (See also W76-05879)
ilton-ORNL)
6-05891

E DISTRIBUTION OF PLUTONIUM IN
KE MICHIGAN SEDIMENTS,
onne National Lab., Argonne, Ill. Radiological
Environmental Research Div.
Karttunen, and D. N. Edgington.
Radiological and Environmental Research
sion Annual Report-Ecology, January through
ember 1974, p 113-127, (1975) 10 fig, 2 tab, 19
W-31-109-Eng-38.

criptors: *Plutonium, *Sediments,
tribution, Sedimentation rates,
dioisotopes, Baseline studies, Lake Michigan,
nology, *Lake sediments, Lakes.
tifiers: *Nuclear studies.

samples were collected and studied to (1)
ide baseline information as to the present con-
of plutonium in sediments from Lake
igan, (2) determine the utility of plutonium
pes for estimating sedimentation rates, (3) as-
the extent of additional radionuclide inputs,
4) determine the vertical distribution in recent
nents. High depositions of plutonium were
d to occur to the north and west of major river
s with the greater part of the radioactivity
concentrated in the sediments of the eastern
of the lake. In the southern half of the lake
e the bottom topography indicates an almost
nuous slope to a maximum depth of 540 ft.,
aximum depth of sediment occurs at a water
of only 240 ft. No sedimentation occurs at
depths less than 150 ft. Therefore, very little
activity is being deposited in the nearshore
The deposition of radioactivity is apparently
controlled by lake-wide processes. (See also
05879) (Chilton-ORNL)
05892

DEVELOPMENTS IN UNDERWATER RADIOTELEMETRY AND PRELIMINARY FISH TRACKING IN THERMAL PLUMES,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05893

COMPARISON OF THE MOVEMENT AND RECAPTURE OF SALMONID FISHES TAGGED AT TWO POWER PLANTS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05894

ORIGIN OF FIN-CLIPPED SALMONIDS COLLECTED AT TWO THERMAL DISCHARGES ON LAKE MICHIGAN,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05895

CONTAMINATION OF FRESHWATER BY MN54 AND CO60,
Commission of the European Communities, Brussels (Belgium); and Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).
For primary bibliographic entry see Field 5C.
W76-05903

SOLUTE TRAVEL-TIME ESTIMATES FOR TILE-DRAINED FIELDS: I. THEORY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
W. A. Jury.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1020-1024, November-December 1975. 6 fig, 14 ref.

Descriptors: *Leaching, *Water quality, *Effluents, *Drainage water, *Solutes, *Path of pollutants, Pollutants, Mathematical models, Forecasting, Wastes, Fertilizers, Water pollution sources, Tiles, Drains, Excess water(Soils).
Identifiers: *Miscible displacement, Effluent concentration, Convective flow, Steady-state system.

A model based on papers by D. Kirkham (1949, 1958) was proposed for calculating solute travel times and effluent water quality for tile-drained soil profiles for cases of ponded and unsaturated surface water input. Variables required for utilization of the model were drain spacing, depth of tile, depth to impermeable zone, soil porosity, and mean discharge rate over the time of study. By using dimensionless variables a characteristic travel-time parameter was introduced which represented a system and allowed the model calculations to be summarized on a single graph. Simulations were run for cases of miscible displacement, step-function surface solute input, and periodic surface solute input; differences between ponded and unsaturated leaching were discussed for tile systems. (See also W76-05905) (Sanderson - ISWS)
W76-05904

SOLUTE TRAVEL-TIME ESTIMATE FOR TILE-DRAINED FIELDS: II. APPLICATION TO EXPERIMENTAL STUDIES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering
W. A. Jury.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1024-1028, November-December 1975. 3 fig, 5 tab, 11 ref.

Descriptors: *Leaching, *Water quality, *Effluents, *Drainage water, *Solutes, *Path of pollutants, Pollutants, Mathematical models, Forecasting, Wastes, Fertilizers, Water pollution sources, Tiles, Drains, Excess water(Soils), Monitoring, Data collections, Legislation.
Identifiers: *Miscible displacement, Effluent concentration, Effluent monitoring, Convective flow, Steady-state system.

The model of Jury (1975) for estimating travel time from surface application to point of discharge for tile-drained fields was applied to data from published studies of tile-drain effluent concentrations and solute flux. In all systems the observed values were consistent with model calculations, and in circumstances where an exact comparison was possible the agreement between measured and predicted values was very good. Measures proposed for improving water quality by requiring standards for effluent discharge levels were discussed and criticized, and model simulations of projected monitoring policies of typical field systems were used to demonstrate the potential for misinterpreting the relationship between surface inputs and output levels. (See also W76-05904) (Sanderson - ISWS)
W76-05905

EFFECT OF SURFACE APPLIED SULFURIC ACID ON WATER PENETRATION INTO DRY CALCAREOUS AND SODIC SOILS,
Arizona Univ., Tuscon. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5G.
W76-05907

COMMENT UPON MULTIVARIATE SYNTHETIC HYDROLOGY,
Centro di Ricerca IBM di Pisa (Italy).
For primary bibliographic entry see Field 2A.
W76-05909

USING PARAMETRIC MODELS OF RUNOFF TO IMPROVE PARAMETER ESTIMATES FOR STOCHASTIC MODELS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W76-05911

NUCLEAR TECHNIQUES IN HYDROLOGY--CURRENT STATUS AND PROSPECTIVE USES.
National Academy of Sciences, Washington, D.C.; National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-05922

HYDROLOGIC ASPECTS OF URBANIZATION,
For primary bibliographic entry see Field 4C.
W76-05925

EFFECT OF URBANIZATION ON THE QUALITY OF RIVER WATER,
B. G. Skakal'skiy.
Soviet Hydrology, Selected Papers, No. 5, p 413-420, 1973. 4 fig, 4 tab, 28 ref. Translated from Transactions of the State Hydrologic Institute (Trudy Gossudarstvennogo Gidrologicheskogo Instituta), No. 206, p 134-145, 1973.

Descriptors: *Urbanization, *Water quality, *Rivers, Sewage effluents, Industrial wastes, Domestic wastes, Detergents, Runoff, Urban runoff, Biochemical oxygen demand, Nutrients, Pollutants, Water pollution, Surface waters.

In our time of rapid economic development and population growth, the effect of human activity on nature has increased sharply and spread to all natural environmental components, leading to their deterioration in some cases. The increase in the utilization of natural resources not only threatens their exhaustion in some cases, but may be accompanied by pollution because of the in-

creasing amount of waste. One of the most important problems to arise is that of meeting the increasing requirements of the population and various branches of the economy for water resources of adequate quality under conditions of waste water disposal into natural bodies of water. Pollution of the hydrosphere is an undesirable effect of many aspects of economic development, including industrialization, urbanization, the development of transportation, and also reclamation and the chemicalization of agriculture. Some aspects of the effect of urbanization on the quality of natural surface waters were examined on the basis of Soviet and foreign investigations. (Sims-ISWS)
W76-05926

SOIL MICROBES,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W76-05935

SOIL PROCESSES AND INTRODUCED CHEMICALS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-05936

SOIL STABILITY AND WATER YIELD AND QUALITY,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W76-05937

EFFECTS OF FOREST FERTILIZATION WITH UREA ON STREAM WATER QUALITY--QUILCENE RANGER DISTRICT, WASHINGTON,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
D. G. Moore.
Research Note PNW-241, March 1975. 9 p, 1 fig, 3 tab, 15 ref.

Descriptors: *Fertilization, Water analysis, *Water quality, Forest management, *Ureas, *Washington, National forests.
Identifiers: *Olympic National Forest(Wash).

Aerial fertilization of two units on the Quilcene Ranger District of the Olympic National Forest with urea at 224 kilograms nitrogen per hectare (200 pounds nitrogen per acre) in April 1970 provided the opportunity to monitor water quality in small streams immediately adjacent ot the treated areas. Applied fertilizer did reach surface streams in the form of urea-, ammonia-, and nitrate-nitrogen, but maximum concentrations measured were well below established permissible limits for public water supplies. Concentrations of urea-N never reached 1.0 part per million, ammonia-N increased only slightly above background, and the highest level of nitrate-N found was 0.121 part per million. Fertilizer nitrogen entered streams only in the form of nitrate after the first 3 weeks, and 95 percent of the total loss over 7 months occurred within the first 9 weeks after application. Fertilizer nitrogen lost during the 7-month monitoring period was about 0.25 percent of the total applied. Introduction of these small amounts of nitrogen into forest streams spread out over a period of several weeks should have little measurable impact on eutrophication. (Forest Service)
W76-05938

DEMAND FOR DISSOLVED OXYGEN EXERTED BY FINELY DIVIDED LOGGING DEBRIS IN STREAMS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W76-05939

TIMBER PRODUCTION AND WATER QUALITY -- PROGRESS IN PLANNING FOR THE BULL RUN, PORTLAND, OREGON'S MUNICIPAL WATERSHED,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
R. L. Fredriksen, and R. N. Ross.
In: Forestry Issues in Urban America, Proceedings, 1974 National Convention, Society of American Foresters, New York City, Sept. 22-26, 1974. p. 168-186. 8 fig, 3 tab, 19 ref.

Descriptors: *Land management, *Planning, *Watersheds(Basins), Soil erosion, Slope stability, Nutrient removal, Turbidity, *Water quality, *Lumbering, Water temperature, *Oregon, *Land use.
Identifiers: Land use planning, Bacteriological quality, Bull Run watershed(Ore).

The land use planning process is discussed with a description given of how available research information can be used in land use planning as demonstrated on the Bull Run Watershed. The detail presented is only a portion of the extensive data used in arriving at an overall management direction for this important watershed. Surface water features of the watershed must be dealt with differently than the land units. As live streams are linear, they do not lend themselves to area representation on a map or in the computer. A separate but compatible system of representation must be employed. The planning process described is new and evolving. It is being tested along with other approaches in use throughout the country. Evaluation and refinement of the plan must be done. Nutrient enrichment, bacteriological quality, and the effect of reservoirs as a source or a sink are areas needing further study. (Forest Service)
W76-05942

IMPACT OF FOREST FERTILIZATION ON WATER QUALITY IN THE DOUGLAS-FIR REGION -- A SUMMARY OF MONITORING STUDIES,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
D. G. Moore.
In: Forestry Issues in Urban America, Proceedings, 1974 National Convention, Society of American Foresters, New York City, Sept. 22-26, 1974. p. 209-219. 2 fig, 4 tab, 11 ref.

Descriptors: Ureas, Nitrates, Nitrites, Ammonia, *Forest management, *Fertilization, Eutrophication, *Water quality, *Watershed management, Leaching, *Douglas fir trees, Pacific Northwest U.S.

Forest fertilization on a commercial scale began in the Pacific Northwest in 1965. Between 1965 and 1969, 36,000 ha were fertilized in western Oregon and Washington. By 1974 this figure had increased to over 285,000 ha. The annual rate of fertilization for the region is approaching 120,000 ha. Coincident with the development of forest fertilization as a management tool, there has been a growing and equally important concern over the possibility of detrimental effects on water quality. Federal and State agencies and private industry have conducted a number of monitoring studies throughout the Douglas-fir region over the past 6 years. Some 29 forest fertilization projects have been monitored covering a wide range of soils, climate and vegetation zones. In most fertilizer applications, urea, ammonium, and nitrate nitrogen are found in streams flowing through areas which are treated. Nitrite nitrogen is not detected. Peak concentrations of urea nitrogen do not persist for more than a few hours, ammonium levels increase as a result of the direct application of urea to open water, and concentrations of nitrate nitrogen in streams usually reach a peak in 2 to 4 days, then decrease to background levels. Maximum concentrations of urea, ammonium, and nitrate nitrogen measured in streams following forest fertilization have not approached levels considered unacceptable in public water supplies. The total amounts of applied nitrogen entering streams draining fertilized forest areas are relatively small and should not have any measurable impact on eutrophication in downstream impoundments. (Forest Service)
W76-05943

HARVESTING SOUTHERN FORESTS: A THREAT TO WATER QUALITY,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
S. J. Ursic.
In: Non-Point Sources of Water Pollution, p. 145-151. 1975. 25 refs. Proceedings of Southeastern Regional Conference conducted at Virginia Polytechnic Institute and State University, Blacksburg, Va.

Descriptors: *Water yield, *Streamflow, *Water quality, *Sediment yield, *Coastal Plains, *Gulf Coastal Plain, Watershed management, Interception, Loblolly pine trees, Water resources, Groundwater recharge, Overland flow, Forest management, Pine trees, Harvesting, Water pollution, Water quality standards, Mississippi.
Identifiers: Site preparation, Sediment production, Harvesting practices, Logging practices, Skidding, Logging roads, Water quality legislation.

Pending regulations under existing legislation make water pollution from forest management activities increasingly significant. A potential conflict exists between the need to increase wood production at competitive costs and the achievement of proposed water quality standards. The impacts of harvesting on water quality in the South have not been quantified, but they are known to be short-lived. Forest managers cannot plan to meet objectives nor can needed research be effective until the standards and how they will be applied are defined. For southern forest conditions research needs include: the influence of present agricultural use on water quality unrelated to present forest practices, the natural variations in forest ecosystem, the intended use of the water affected, and the temporary effects of infrequent disturbances. (Forest Service)
W76-05945

PESTICIDE RESIDUE DYNAMICS IN FOREST ECOSYSTEM: A COMPARTMENT MODEL,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
W. L. Webb, H. J. Schroeder, Jr., and L.A. Norris.
Simulation, Vol. 24, No. 6, p. 161-169, 1975. 9 fig, 2 tab, 7 ref.

Descriptors: *Pesticide residues, *Computer models, *Herbicides, 2,4,5-T, Toxicity, Ecosystems, Environmental effects, Seasons, Forest management, Model studies, Computer programs, Oregon, California.
Identifiers: Seasonal changes.

A computer model of the movement of pesticide residues in a forest ecosystem is described. The potential direct effects on target and nontarget organisms are emphasized; the very long-term consequences of restructuring the vegetation in the ecosystem are not discussed. Simulations using the model trace the movement of two herbicides (2,4,5-T and picloram) through two different environments, one typical of an Oregon forest and the other typical of southern California chaparral. The model is written in DYNAMO. (Forest Service)
W76-05946

DICAMBA RESIDUES IN STREAMS AFTER FOREST SPRAYING,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
L. A. Norris, and M. L. Montgomery

lletin of Environmental Contamination and xicology, Vol. 13, No. 1, p 1-8, 1975. 3 fig, 1 tab, ref.

scriptors: *Chemcontrol, *Brush control, Herides, Path of pollutants, Water pollution rces.
ntifiers: *Chemical brush control, *Dicamba, erbicide Residues, Forest spraying.

rial application of 1.12 kg dicamba and 2.24 kg -D per hectare in 37.8 L of water resulted in asurable residues of dicamba in water. Samples re not analyzed for 2,4-D. A maximum dicamba ncentration of 37 ppb occurred 5.2 hr after appliion. The concentration fell rapidly and reached kground levels 37 hr after application. Approxtely 3 days after application a small increase in ncentration to a maximum level of 9 ppb ocred in connection with a small rainstorm. Herde concentration levels were markedly uced with time and distance downstream. Samg continued for more than a year after applica, but detectable residues were not found more 11 days after application. The dicamba dues detected in this study pose no acute ard to aquatic organisms or to downstream er users. Short persistence of the herbicide in water precludes chronic exposure. (Forest Ser-
)
5-05949

LYBDENUM IN A NEARSHORE AND UARINE ENVIRONMENT, NORTH WALES.
thampton Univ. (England). Dept. of Oceanogy.
primary bibliographic entry see Field 2K.
-06000

TER AND PHOSPHATE TRANSPORT TO NT ROOTS,
al Veterinary and Agriculture Coll., enhagen (Denmark). Hydrotechnical Lab.
primary bibliographic entry see Field 2I.
-06002

MICAL CHARACTERIZATION OF INDUSAL WASTEWATERS BY GAS CHROTOGRAPHY-MASS SPECTROMETRY,
ronmental Research Lab., Athens, Ga.
primary bibliographic entry see Field 5A.
06008

SE AND IDENTIFICATION OF TASTE ODOUR COMPOUNDS IN WATER,
instituut voor Drinkwatervoorziening, The e (Netherlands).
rimary bibliographic entry see Field 5A.
06009

URRENCE OF PHYTOPHTHORA SPECIES OTHER POTENTIAL PLANT TOGENS IN RECYCLED IRRIGATION ER,
rnia Univ., Berkeley. Dept. of Plant Patholo-
imary bibliographic entry see Field 5C.
6010

IBUTION AND STRUCTURE OF HIC ASSEMBLAGES IN PUGET SOUND, INGTON, USA,
Nations Educational, Scientific, and Culrganization, Paris (France).

ol (Berl). 26(3): 203-223. 1974.

ptors: *Benthic fauna, *Distribution pat-*Washington, Salinity, Sounds, Temperarustaceans, Particle size, Water pollution, mnion, Bottom sediments.
ers: Echinoderm, Lamellibranch, *Puget Wash).

Benthic infauna was collected with a 0.2 m2 van Veen grab at 48 stations in Puget Sound, Washington, during Feb.-March 1969. All the crustaceans, lamellibranchs, and echinoderms were identified and counted. Particle size, distributions and N contents of the sediments, depths and temperature and salinity of the bottom water were determined at all stations. The first 3 factors of a factor analysis applied to between-station measures of affinity, explained 41.26% of the total variance. The 1st factor had representative stations on shallow-water mud bottoms, the 2nd factor on bottoms dominated by coarse sediments and the 3rd factor had representative stations on deep-water mud bottoms. The factor analysis did not result in clusters of stations that could be interpreted as discrete benthic communities. The frequency distribution of specimens among the species was in good agreement with a log-normal distribution. The species diversity ranged from 0.34 bits/individual to 4.35 bits/individual and there was a weak trend of increasing diversity towards coarser sediments. The 1st 3 factors applied to the matrix of between-species correlation coefficients explained 43.72% of the total variance. Each group of species could be identified with particular environments. Only about 24% of the variability in standing crop could be attributed to variability in sediment types, N content in the sediments, salinity of the bottom water and depth.--Copyright 1975, Biological Abstracts, Inc.
W76-06015

CHANGES IN THE LIMNOLOGICAL FEATURES OF A MEROMICTIC LAKE SUIGETSU DURING THE YEARS, 1926-1967,
Nagoya Univ. (Japan). Water Research Lab.
For primary bibliographic entry see Field 2H.
W76-06018

ON THE POSSIBILITIES OF AVERAGING THE SEASONAL PATTERN IN KJELDAHL NITROGEN IN A GROUP OF WATER BODIES,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
J. Hrbacek.
Int Rev Gesamten Hydrobiol. 59(3): 395-402. 1974.

Descriptors: *Nitrogen, *Ponds, *Seasonal, Average.
Identifiers: *Kjeldahl nitrogen.

It is shown that the seasonal change of Kjeldahl N in several ponds and several years shows an average seasonal change which is statistically significant on a month-to-month basis although not apparent at first sight. The relative deviation of Kjeldahl N values in individual months and individual ponds from seasonal averages of individual ponds is closer to lognormal than to normal distribution. The seasonal curve based on average values of relative deviations in individual months and ponds from the seasonal averages of individual ponds shows the lowest variation of average monthly values and is therefore most adequate to a comparison of the seasonal pattern of two or more groups of water bodies.--Copyright 1975, Biological Abstracts, Inc.
W76-06019

TRACE METALS IN THE WATERS OF THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W76-06024

PLASTICS AND SYNTHETICS POINT SOURCE CATEGORY (PROPOSED EFFLUENT LIMITATIONS AND GUIDELINES).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06086

MICROBIOLOGICAL AND CHEMICAL ENRICHMENT OF FRESHWATER-SURFACE MICROLAYERS RELATIVE TO THE BULK-SUBSURFACE WATER,
Virginia Univ., Charlottesville. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-06124

EMORY OAK (QUERCUS EMORYI) LITTER PHENOLICS AS ENVIRONMENTAL HAZARDS FOR AQUATIC ANIMALS IN SOUTHEASTERN ARIZONA,
Colorado State Univ., Fort Collins.
W. J. McConnell, and G. F. Adams.
J Ariz Acad Sci. 8(3), p 111-115, 1973.

Descriptors: *Phenols, *Arizona, *Oak tree, *Litter, Aquatic animals, Organic compounds, Toxicity, Daphnia, Environmental effects, Conifers.

Phenolic compounds (15) present in water extracts of litter of Emory oak (Q. emoryi) did not cause a discernable toxic response during 20-30 day exposures of 3 kinds of aquatic animals common in southeastern Arizona at 20 mg/l gallotannin equivalent. This concentration probably represents an unusually high, but occasionally attainable, natural concentration of total phenolics. A conifer phenolic flavonoid (taxifolin) closely similar to the oak phenolic quercetin depressed reproduction and/or survival of Daphnia pulex populations.--Copyright 1974, Biological Abstracts, Inc.
W76-06125

YEASTS ISOLATED FROM SOME LAKES AND RIVERS OF SASKATCHEWAN,
National Research Council of Canada, Saskatoon (Saskatchewan) Prairie Regional Lab.
J. F. T. Spencer, P. A. J. Gorin, and N. R. Gardner.
Can J Microbiol. 20(7), p 949-954, 1974.

Descriptors: *Canada, Lakes, Rivers, *Yeasts, Isolation, *Bacteria, Bioindicators, Water pollution effects, Trees, Soils, Water pollution sources.
Identifiers: *Saskatchewan River.

Yeasts were isolated from lakes in northern Saskatchewan, from the Saskatchewan River between Prince Albert and Cumberland House, and from 3 small lakes near Saskatoon, (Canada), 2 of which form part of recreational areas. Yeast and bacterial counts were relatively low, less than 400 yeast cells/liter, except in samples taken near towns and industrial plants which discharged waste into the rivers or lakes. There was little change in the numbers of yeast cells in waters used for recreational purposes only, but the number of species isolated increased considerably. Most of the yeasts isolated from the other lakes and rivers were species known to occur in association with trees and in soils.--Copyright 1974, Biological Abstracts, Inc.
W76-06135

MERCURY OCCURRENCE IN SEDIMENT CORES FROM WESTERN LAKE ERIE,
Bowling Green State Univ., Bowling Green, Ohio. Dept. of Geology.
L. J. Walters, Jr., T. L. Kovacik, and C. E. Herdendorf.
Ohio J Sci. 74(1) p 1-19, 1974.

Descriptors: *Mercury, *Lake Erie, *Lake sediments, *Pollutant identification, Water pollution sources, Mathematical models, Path of pollutants.
Identifiers: Detroit River(Mich).

The Detroit River is the major source of Hg contamination in the sediments of western Lake Erie. Analyses of 63 sediment cores indicate that the Hg consists of 2 components: a high-concentration (0.5-4.0 ppm of dry sediment) Hg-enriched surface zone, whose concentration decreases pseudo-ex-

ponentially with depth, and low-concentration (0.04-0.09 ppm of dry sediment) relatively constant-background zone. Mathematical modeling of the Hg concentration as a function of depth in these sediment cores and subsequent statistical analysis of the apparent constant-concentration levels reveals that 2 log-normal distributions are necessary to describe these observed constant concentrations. Any Hg concentration within the sediment in excess of the lower (natural) background level plus 1 SD is defined as being due to pollution. Such calculations of the pollution component for these 63 cores serve as the basis for an estimate of the total Hg that has been added through pollution sources. The Hg-pollution load for bottom sediments of western Lake Erie is estimated to be 228 metric tons. --Copyright 1974, Biological Abstracts, Inc.
W76-06137

BEHAVIOUR OF SOME PHOSPHATIC FERTILIZERS IN WATER,
Khatauli Manure Mills, Khatauli (India).
B. S. Gupta.
J Indian Soc Soil Sci. 21(4), p 413-420, 1973.

Descriptors: *Fertilizers, *Phosphates, Carbon dioxide, Soils, Degradation(Decomposition), Decomposing organic matter, Water pollution sources.
Identifiers: *Bone meal, Phosphatic rock, Slag.

The behavior of raw bone meal, steamed bone meal, calcined bone meal, rock phosphate, calcined rock phosphate and high grade basic slag in water at different conditions was studied. Water plays an important role in the decomposition of these phosphates; it remains active 50-60 days in the case of calcined rock, bone phosphates, basic slag and rock phosphate. In the case of raw and steamed bone meals, water is also responsible to form organic acids which increase the rate of decomposition and improve the phosphate status in aqueous solutions. CO2 decomposed these phosphatic materials; its efficiency was pronounced at low concentration. The relative solubility in CO2 and water followed the order: raw bone meal > steamed bone meal > calcined bone meal > high grade basic slag > calcined rock phosphate > rock phosphate. The suitability of these phosphatic fertilizers for different soil conditions is discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-06139

STUDIES ON DEPTH AND QUALITY OF WATER ON SOIL SALINIZATION: BEHAVIOUR OF ANIONS IN THE SOIL PROFILE WITH REFERENCE TO THE POSITION OF WATER TABLE,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W76-06141

THE COMBINED EFFECTS OF HIGH SALINITY AND TEMPERATURE ON THE SURVIVAL OF YOUNG LIMANDA LIMANDA,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W76-06148

EVALUATION OF SURFACE WATER POLLUTION AT SEVERAL POINTS IN RELATION TO ZONES OF SHELLFISH INDUSTRY IN ROADSTEADS OF THE BREST REGION, (IN FRENCH),
G. Martin-Bouyer, H. Veiga-Pires, G. Salama, J. P. Bechac, and F. Roger.
Rev Int Oceanogr Med. 31/32 p 91-121, 1973.

Descriptors: *Bacteria, Coliforms, E. coli, *Bioindicators, Water pollution sources, Seasonal, Industrial wastes, *Organic wastes, Euteric bacteria, Dissolved oxygen, Shellfish, Temperature.
Identifiers: *France(Brest region).

Water samples (258) were studied, considering the following 10 parameters: coliforms, Escherichia coli, enterococci, temperature, pH, salinity, nitrites, organic matter, dissolved oxygen and BOD5 (biochemical oxygen demand). The levels of organic and bacteriological pollution were almost constant through the week. The tide had no influence on the pollution indicators, only on the salinity. Organic pollution depended on the location of the sampling stations. Fecal pollution followed almost the same pattern as organic pollution: Landerneau had the highest pollution level, Faou the lowest. Both organic and fecal pollution were strongly influenced by the seasons: the level of organic pollution was always higher in June-July; the 3 bacteriological tests indicated a variation of fecal pollution according to the seasons, but each test gave different results.--Copyright 1974, Biological Abstracts, Inc.
W76-06150

5C. Effects Of Pollution

STUDIES ON THE EFFECTS OF COPPER ON THE LACTATE DEHYDROGENASE AND ESTERASE ISOZYMES IN VARIOUS TISSUES OF CARASSIUS CARASSIUS,
Dong kook Univ., Seoul (Republicof Korea). Dept. of Science Education.
Choon-Koo Lee, and Il-Young Choo.
Korean J Zool. Vol 16, No 2, p 79-96. 1973. Illus.

Descriptors: *Copper, *Toxicity, Pathology.
Identifiers: *Carassius-Carassius, Isozymes, Lactate dehydrogenase, LDH.

Histology and lactate dehydrogenase (LDH) isozyme patterns were studied by cellulose acetate electrophoresis, LDH activity and environmental Cu effect on LDH by spectro-photometry, esterase isozyme patterns by agar thin layer electrophoresis and Hb patterns by starch gel electrophoresis. Kidney, liver, gill, muscle, blood and brain tissue histopathology were studied.--Copyright 1975, Biological Abstracts, Inc.
W76-05595

INTERACTIONS OF MERCURY WITH AQUATIC AND EDAPHIC ENVIRONMENTS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-05601

EVALUATION OF THE TROPHIC TYPES OF SEVERAL ALASKAN LAKES BY ASSESSMENT OF THE BENTHIC FAUNA,
Alaska Univ., College. Inst. of Water Resources.
J. D. LaPerriere.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 158, $4.50 in paper copy, $2.25 in microfiche. Report No. IWR-63, March 1975. 49 p, 9 fig, 9 tab, 27 ref, append. OWRT A-046-ALAS(1).

Descriptors: *Alaska, *Lakes, *Benthic fauna, Trophic level, *Oligotrophy, Invertebrates, Arctic, Subarctic, Diptera, Tubificids, Worms, Water pollution effects.

Selected morphometric, chemical, and physical parameters for six Alaska lakes are presented. Except for Big Lake, for which there is inadequate data, and Memory Lake, which is shallow, these lakes appear to be oligothrophic. Identification and enumeration data concerning the benthic macroinvertebrates are tabulated. The finding of chironomids indicative of oligotrophy is not conclusive evidence that a lake is oligotrophic, but may indicate only that it has been oligotrophic. From evidence such as the high-standing crop tubificid worms in certain areas of Harding Lak as well as the high hydrophyte biomass, it is co cluded that the trophic state system of lake cla sification may not be valid for the Alaskan subar tic and arctic.
W76-05604

STATISTICAL STUDY OF THE DUCKWE RHIZOSPHERE AS AN ECO-ASSAY TOOL,
Massachusetts Univ., Waltham. Dept. of Enviro mental Sciences.
For primary bibliographic entry see Field 5B.
W76-05605

EFFECTS OF FOREST FERTILIZATION TWO SOUTHEAST ALASKA STREAMS,
Forest Service (USDA), Corvallis, Oreg. Paci Northwest Forest and Range Experiment Statio W. R. Meehan, F. B. Lotspeich, and E. W. Mueller.
Journal of Environmental Quality, Vol 4, No 1 50-55, 7 fig, 3 tab, 9 ref. Jan.-Mar. 1975.

Descriptors: *Water quality, Primary product ty, *Nitrogen, *Fertilization, Forest manageme *Alaska, Ureas, Water pollution effects.
Identifiers: Ammonia-nitrogen.

Four streams in southeast Alaska were studied determine the effects of forest fertilization w urea on basic productivity and water quality. A tial, short-term increase in ammonia-nitrogen observed in the treated streams, and nitr nitrogen levels increased and remained high co pared to control stream levels during the year lowing treatment. Concentrations did not proach those considered toxic to aquatic life or safe for human consumption. Changes in biom of periphyton and benthic fauna as a result of tilization were not detected. (Forest Service)
W76-05612

ESTIMATING DRY WEIGHT OF LI UNANESTHETIZED FISH BY PHOTOGRAPH
Forest Service (USDA), Corvallis, Oreg. Pac Northwest Forest and Range Experiment Stati
For primary bibliographic entry see Field 5A.
W76-05615

THE APPLICATION OF SEQUENTIAL E MATION METHODS TO COUNTS PHYTOPLANKTON,
Comitato Nazionale per l'Energie Nucleare, R (Italy). Technological Lab.
For primary bibliographic entry see Field 5A.
W76-05622

MACROBENTHIC POPULATION DYNAM IN INDIANA WATERS OF LAKE MICHIGA 1970,
Ball State Univ., Muncie, Ind.
J. H. Rains
Available from the National Technical Info tion Service, Springfield, Va. 22161, as COM 10461 $5.50 in paper copy, $2.25 in microfiche thesis, November 1971. 89 p, 18 fig, 14 tab, 84

Descriptors: *Benthic fauna, *Biological com nities, *Dynamics, *Indiana, *Lake Mich Oligochaetes, Diptera, Water pollution, Eutro cation, Trophic level, Amphipods, Ecological tribution, Varieties, Fish food organisms, Mid
Identifiers: Sphaeriids, Pontoporeia affinis.

The distribution of the predominant macrobe in Indiana waters of Lake Michigan were stu and classified. The order of abundance of major types of organisms collected was oligochaetes (64%), Pontoporeia affinis (2 sphaeriids (12%), and chironomids Oligochaetes averaged 4444/sq m. Based oligochaete abundance, 21% of the samples

cted were from heavily polluted water, 42% in oderately polluted, and 37% in slightly polluted ater. P. affinis averaged 993/sq m and presented 21% of the macrobenthos, the haeriids 691/sq m and 12% of the population, d the chironomids 242/sq m comprising 3% of population. Eutrophic chironomid species re most abundant, accounting for 56% of the ronomid population. The Michigan City nsect had the greatest abundance and highest rcent composition of chironomids and aeriids. The Burns Ditch transect had the hest percent composition and abundance of ochaetes. Th Gary transect had the greatest ndance and highest percent composition of P. inis. A trophic classification using indicator ronomid species showed that the Michigan City nsect was eutrophic; the Burns Ditch transect n more eutrophic; and the Gary transect sotrophic. The Indiana waters of Lake higan were in the eutrophic range, with few ex-tions. (Buchanan-Davidson--Wisconsin)
6-05623

LATIONSHIPS BETWEEN DRAINAGE EA CHARACTERISTICS AND NON-POINT RCE NUTRIENTS IN STREAMS.
ific Northwest Environmental Research Lab., vallis, Oreg.
primary bibliographic entry see Field 5B.
5-05624

E FATE OF NUTRIENTS IN BACK RIVER,
s Hopkins Univ., Baltimore, Md.
Ferguson, and D. Simmons.
ilable from the National Technical Informa-Service, Springfield, Va 22161, as PB-241 004 0 in paper copy, $2.25 in microfiche. Ches-ke Research Consortium, Inc. Publication No NSF-RA-E-74-035) June 1974. 30 p, 8 fig, 2 tab,

criptors: *Nutrients, *Cycling nutrients, aries, Phosphorus compounds, Nitrogen com-ds, Phytoplankton, Denitrification, Sedi-s, Model studies, Growth rates, Standing e, Tidal effects, Nutrient removal, Waste r treatment, Effluents, Maryland.
tifiers: *Back River(Maryland).

of nutrients introduced into Back River by Baltimore, Maryland, wastewater treatment was studied to provide basic information for ating the extent of nutrient transformations oss. All fractions decreased rapidly along the ry, with net conversion of orthophosphate to ulate phosphorus and of ammonia to particu-nitrogen, nitrite, and nitrate, indicating ter-fall phytoplankton growth and bacterial cation. Phosphate accumulated in sediments than nitrogen. A finite section, one-dimen-, steady state model of the estuary was oped. It demonstrated that nitrogen is not rved in the water column. Net nitrogen approached 50% of the influx, primarily he treatment plant. Nutrient concentrations o high that estuarine phytoplankton growth and standing crops were not limited. en or phosphorus removal from waste rges might not significantly reduce growth r standing crops because of nutrient release ediments, poor tidal dispersion, and estuary g. The results delineate nutrient cycling in ary. Phytoplankton productivity, standing oxygen demand, and dissolved oxygen ics should be determined in order to model of waste discharge on other water quality . The results will help determine what t removal strategy will be most beneficial. nan-Davidson--Wisconsin).
625

REPORT ON WATER QUALITY AND WASTE-SOURCE INVESTIGATIONS, BIG SIOUX RIVER AND SELECTED TRIBUTARIES.
National Field Investigations Center, Denver, Colo.
Available from the National Technical Information Service, Springfield, Va, 22161, as PB-227 833, $8.00 in paper copy, $2.25 in microfiche. Report August 1973. 247 p. 15 fig., 11 tab., 4 ref., 11 append.

Descriptors: *Rivers, *Water quality, *Water pollution sources, *Iowa, *Minnesota, *South Dakota, Treatment facilities, Sewage effluents, Farm wastes, Dissolved oxygen, River basins, Streams, Biochemical oxygen demand, Suspended solids, Nitrogen compounds, Disinfection, Water quality standards, Pollutants, Pollution abatement, Permits, Industrial wastes, Municipal wastes, Waste water treatment, Ammonia, Phosphorus, Eutrophication, Coliforms.
Identifiers: *Big Sioux River(S.D.-Iowa), *Sioux Falls(S.D.), Rock River(Minn.).

Water quality degradation of the Big Sioux River Basin in Iowa, Minnesota, and South Dakota is caused by urban, agricultural, and industrial pollution sources. Studies of dissolved oxygen and stream biota showed that the most severe pollution was downstream from Sioux Falls, South Dakota. Major pollution sources included industrial condenser water, process wastes, and wastewaters from the Sioux Falls Wastewater Treatment Plant. To protect the water quality of the Big Sioux River and its tributaries, it is recommended that a waste discharge permit issued to Sioux Falls restrict daily effluents to BOD - 10 mg/1; SS - 15 mg/1; and TKN - 2 mg/1, and to stipulate that continuous disinfection restrict coliform density to 200/100 ml and no weekly average to exceed 400/100 ml. That Sioux Falls establish enforceable pretreatment standards for those pollutants not susceptible to treatment by the municipal system and that the pretreatment standards include adequate sewer charges for all industrial waste sources. That waste discharge permits issued to other municipalities discharging into the Big Sioux River should require a minimum of secondary treatment. That Iowa and Minnesota initiate appropriate abatement actions; and that the existing water quality standards for South Dakota, Iowa, and Minnesota be brought into conformity. (Buchanan-Davidson--Wisconsin).
W76-05626

EUTROPHIC GRADIENT IN SMITH MOUNTAIN LAKE, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
E. F. Benfield, and A. C. Hendricks.
Virginia Journal of Science, Vol. 26, No. 1, p. 20-26, 1975. 11 fig., 1 tab., 15 ref.

Descriptors: *Eutrophication, *Gradation, *Reservoirs, Virginia, Industrial wastes, Municipal wastes, Primary productivity, Chlorophyll, Light penetration, Dissolved oxygen, Seasonal, Thermal stratification, Trophic level.
Identifiers: *Smith Mountain Lake(Virginia), Smith Mountain Dam(Virginia), *Roanoke River(Virginia), Blackwater River(Virginia).

Smith Mountain Lake is a storage reservoir for the Smith Mountain-Leesville Pumped-Storage Hydroelectric Project which is located on the Roanoke and Blackwater Rivers near Roanoke, Virginia. The headwaters of the Roanoke River Arm of Smith Mountain Lake have become eutrophic because of the continuous introduction of municipal and industrial effluents into the Roanoke River as it goes through the Roanoke metropolitan area. The studies show that the Roanoke River Arm of Smith Mountain Lake differed from areas near the Smith Mountain Dam in primary production rates, chlorophyll-a concentration, water transparency, depth of light penetration, and surface oxygen saturation. A gradient in some of these areas was observed in the fall, spring, and summer. The Roanoke River Arm could probably be classified as eutrophic, probably due to high nutrient loading by municipal and industrial discharges and the morphometry of the basin and surrounding terrain. There was a demonstrable gradient from eutrophic to mesotrophic conditions from the lake headwaters toward the Smith Mountain Dam. Tertiary sewage treatment facilities being built in Roanoke should relieve the nutrient loading of the lake. (Buchanan-Davidson--Wisconsin).
W76-05627

SURVIVAL OF ESCHERICHIA COLI IN STREAM WATER IN RELATION TO CARBON DIOXIDE AND PLANT PHOTOSYNTHESIS,
Culture Centre of Algae, Protozoa, Cambridge (England).
E. A. Gray.
Journal of Applied Bacteriology, Vol. 39, No. 1, p. 47-54, 1975. 3 fig., 12 ref.

Descriptors: *Bacteria, *E. coli, *Carbon dioxide, *Inhibition, Photosynthesis, Coliforms, Viability.
Identifiers: Cambridge(England).

Survival of coliform bacteria, especially Escherichia coli, was studied in a chalk stream, Hobson's Brook, near Cambridge, England, and in the laboratory in relation to physical and biotic factors. Peak populations were usualy associated with rainfall during the previous twelve hours. Some cells appeared to survive for long periods. The surrounding area had been used to graze sheep, but recently the land has been used for raising cereal crops. E. coli incidence was investigated in other chalk streams, brackish pools on peat, seawater, and water from a mountain stream. During laboratory studies in liquid, E. coli showed waves of growth. The carbon source appeared to be atmospheric carbon dioxide; E. coli ceased to grow when air free of atmospheric carbon dioxide was passed over the culture. When grown in a suspension of bacteria-free algae Stichococcus bacillaris, E. coli growth decreased in cultures grown in the light compared to those grown in the dark. After cessation of photosynthesis, E. coli growth increased. Field observations suggested an inverse relationship between E. coli numbers and mass of photosynthesizing green plants; decrease in carbon dioxide in natural waters due to photosynthesis may cause reduction of coliforms (especially E. coli) which require carbon dioxide for growth. (Buchanan-Davidson--Wisconsin).
W76-05628

EUTROPHICATION OF AN INLAND LAKE IN IRELAND IN ASSOCIATION WITH THE INTENSIFICATION OF PIG FARMING IN THE CATCHMENT AREAS,
Department of Agriculture and Fisheries, Dublin (Ireland). Advisory Services and Livestock.
E. J. Keating, and V. A. Dodd.
Agriculture and Environment, Vol. 2, No. 1, p. 55-64, 1975. 4 tab., 12 ref.

Descriptors: *Eutrophication, *Lakes, *Farm wastes, *Agriculture, Watersheds(Basins), Topography, Hydrology, Retention, Nutrients, Soil disposal fields, Fertilization, Runoff, Lake fisheries, Rates of application, Confinement pens, Hogs, Waste disposal.
Identifiers: *Ireland, *Lough Sheelin(Ireland).

Eutrophication of Lough Sheelin, Ireland, is taking place due to intensive pig production in its watershed. Retention time of water in the lake is about 0.5 years, thus nutrients carried into the lake in the winter are available to stimulate spring growth of algal blooms, especially Aphanizomenon. The 853 kg manure produced per pig production/place per annum relates to feed and water consumed. Studies of the nutrient content and fertilizer value of pig manure show that the effect when spread on land varies with weather, soil

permeability, slope, application rate, and evapotranspiration rate; therefore care must be taken when spreading manure. In the Sheelin area, the most suitable time for spreading manure is usually May 28-July 14. Nutrient reaction in the soil and lake are discussed. Nitrate and phosphorus levels in Lake Sheelin are increasing, causing dense algal blooms which are injurious to fish and reduce water transparency. A safe, efficient, and economical method of manure disposal is needed. Animal production research must foresee problems arising from application of its findings to farming practice; these must be studied in association with production, not as a salvage operation. (Buchanan-Davidson--Wisconsin).
W76-05629

CHEMISTRY OF MUD-WATER INTERFACE IN AN IMPOUNDMENT,
Illinois State Water Survey, Urbana.
W-C. Wang.
Water Resources Bulletin, Vol. 11, No. 4, p. 666-675, 1975. 7 fig., 21 ref.

Descriptors: *Mud-water interfaces, *Water chemistry, *Impoundments, Illinois, Model studies, Oxidation-reduction potential, Thermal stratification, Dissolved oxygen, Chemical stratification, Turnovers, Hydrogen ion concentration, Alkalinity, Silica, Manganese, Chemical reactions, Nitrogen compounds, Bottom sediments, Chlorine, Reservoirs.
Identifiers: *Lake Evergreen(Ill.).

A model of chemistry at the mud-water interface was developed from observations of Lake Evergreen, Illinois, during and after filling. Aging occurred early in the impoundment stage. Hydrologic and biological activities and reduction of the oxidation-reduction potential influenced interface chemistry. Temperature and dissolved oxygen profiles showed chemostratification until fall overturn when distribution was non-parallel; pH decreased with warm temperatures and abundant food. Maximum alkalinity, silica, manganese, ammonia, and nitrogen coincided with minimum pH. Silica was utilized by diatoms which was then precipitated, enriching the bottom. These changes occurred primarily in autumn. Nitrate and nitrite had summer maxima. Kjeldahl nitrogen had summer and autumn maxima. Dissolved oxygen deficiencies developed in spring, causing anoxic conditions until fall. During fall decomposition, pH dropped below 8.0, and alkalinity, silica, ammonia, and Kjeldahl nitrogen increased. All parameters except conservative elements at the interface showed qualitative changes. There was no quantitative evidence how the interface affected the lake ecosystem. Sum of volume of transitional zone/total volume multiplied by the 365 days interval estimated the transitional zone versus total water body on a yearly basis. About 6-7% of the water body is anoxic annually, which is important for regeneration and replenishment of chemicals from bottom to overlying water. (Buchanan-Davidson--Wisconsin).
W76-05630

EFFECTS OF SALINITY ON NITRIFICATION IN THE EAST RIVER,
New York State Dept. of Health, Albany. Environmental Health Center.
M. Chen, E. Canelli, and G. W. Fuhs.
Journal Water Pollution Control Federation, Vol. 47, No. 10, p. 2474-2481, 1975. 3 fig., 3 tab., 25 ref.

Descriptors: *Estuaries, *Salt tolerance, *Nitrification, *Nitrogen fixing bacteria, *Inhibition, Salinity, New York, Water chemistry, Sodium chloride.
Identifiers: *East River(NY), Hudson River(NY).

Bacterial nitrification rates increased when samples were diluted with suitable media prepared with distilled water. Nitrification rates in samples from southern or central parts of the East River, New York, were higher than in samples near the sound where river water was mixed with oceanic water and Hudson River water, possible affecting water quality and/or the number of nitrifying bacteria. Isolated nitrifying bacteria were not halophilic, indicating that local nitrifying flora are essentially terrestrial in origin. No attempt was made to estimate the numbers of nitrifying bacteria. However, significant numbers were present. Salinity does not appear to be the sole cause for inhibition of nitrification. Concentrations of iron, phosphate, and magnesium exceeded the minimum requirements. The rate of nitrification in a 1 + 9 dilution of East River water was not significantly changed by omitting the usual supplements of calcium, magnesium, phosphate, and iron. Because East River water did not lack essential nutrients (nitrogen, calcium, magnesium, phosphate, iron), it is concluded that nitrification rates in the river are controlled by sodium chloride and unknown inhibitory elements. Temperature and dissolved oxygen also play important roles. (Buchanan-Davidson--Wisconsin).
W76-05631

PHOSPHORUS, NITROGEN, AND THE GROWTH OF ALGAE IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
C. Serruya, and T. Berman.
Journal of Phycology, Vol. 11, No. 2, p. 155-162, 1975. 5 fig., 1 tab., 34 ref.

Descriptors: *Cytological studies, *Eutrophication, *Phosphorus compounds, *Nitrogen compounds, *Algae, Growth rates, Lakes, Limiting factors, Absorption, Carbon, Chlorophyll, Phytoplankton, Dinoflagellates, Biomass.
Identifiers: *Lake Kinneret(Israel), Peridinium cinctum, Alkaline phosphates, Luxury uptake.

Annual and seasonal variations in algal intracellular chemical composition in Lake Kinneret, Israel, were studied to determine nutrient limitations. Intracellular carbon, nitrogen, phosphorus, and chlorophyll concentrations were determined. Fluctuations in carbon:phosphorus, carbon:nitrogen, chlorophyll concentrates and nitrogen were related to nutrient conditions which influence annual phytoplankton development especially Peridinium cinctum blooms. High intracellular phosphorus at the beginning the bloom indicate adequate phosphorus supply and luxury consumption for short periods. Later, Peridinium grew despite high carbon: phosphorus ratios. Phosphorus usually limited growth eventually, but the 1970 bloom ceased despite high intracellular phosphorus. These observations, together with evidence from nutrient addition, and specific alkaline phosphatase determinations indicated that during most of the bloom, Peridinium was not directly limited by phosphorus. Bloom decline is usually marked by high carbon:phosphorus ratios. Phosphorus shortage often contributes to bloom cessation and limits fall phytoplankton growth. From 1969-1973, perhaps due to a drop in salinity, there were lower biologically-bound phosphorus levels without corresponding decreases in carbon biomass. Reasons for annual Peridinium bloom decline is complex and varies each year. High water temperature and light intensities, lake current patterns, and phosphorus are involved. A dissolved organic nitrogen increase, possibly from dinoflagellate breakdown, may slow Peridinium growth. (Buchanan-Davidson-Wisconsin)
W76-05633

AN ICHTHYOFAUNAL SURVEY AND DISCUSSION OF FISH SPECIES DIVERSITY AS AN INDICATOR OF WATER QUALITY, CODORUS CREEK DRAINAGE, YORK COUNTY, PENNSYLVANIA,
York Coll., Pa.
For primary bibliographic entry see Field 5A.
W76-05634

CHEMICALLY ENHANCED C02 GA EXCHANGE IN A EUTROPHIC LAKE: GENERAL MODEL,
Lamont-Doherty Geological Observator Palisades, N.Y.
S. Emerson.
Limnology and Oceanography, Vol. 20, No. 5, 743-753, 1975. 4 fig., 8 tab., 18 ref.

Descriptors: *Carbon dioxide, *Model studi *Transfer, *Boundary process, *Lakes, Eutrop cation, Diffusion, Kinetics, Air-water interfac Canada.
Identifiers: *Experimental Lakes Area(Ontario).

Carbon dioxide exchange between the atmosph and water is governed by diffusion kinetics and interfacial boundary layer reaction. Study of La 227, Experimental Lakes Area, Ontario, show carbon dioxide invasion rate could not be plained by assuming a simple diffusion process. quantitate reaction effect on carbon dioxide exchange rate, empirical data were derived fro lake simulation experiment and whole lake carb balance. The theoretical basis for the enhancem factor was studied and model developed to expl chemical enhanced gas exchange. This model dicated that carbon dioxide invasion of this l was 5-10 times that predicted if there was no re tion. Model results conformed with laboratory bon dioxide invasion experiments. Chem enhancement was caused by strong carbon diox gradients in the epilimnion being depleted of bon dioxide by eutrophication. This factor creased with increased boundary layer thickn but total flux decreased. Carbon dioxide exchange rate calculations, especially in eutro lakes, may have relatively large enhancement tor. Due to the wide range of alkalinity, pH natural waters, simplified enhancement fa derivations used for oceans are not always plicable. This generalized model can be applie many chemical and physical situation. (Bucha Davidson--Wisconsin)
W76-05635

ASSESSMENT OF A STRESSED MACRO VERTEBRATE COMMUNITY,
Virginia Polytechnic Inst. and State U Blacksburg. Dept. of Biology.
C. H. Hocutt.
Water Resources Bulletin, Vol. 11, No. 4, p. 835, 1975. 9 fig., 1 tab., 22 ref.

Descriptors: *Analytical techniques, *Be fauna, *Stress, *Biological communities, Virg Standing crops, Water pollution effects, Dist tion, Niches, Bioindicators.
Identifiers: New River(Va.), Ordination met Diversity index.

The benthic fauna community tolerance to s is dependent on the receiving system and th ture and degree to which stress is applied. W stress causes a response, the number of o isms, taxa, or both will be affected. An ordin method is described which assesses the effec stress on macroinvertebrate community in River, Virginia, and compared to the dive index method. In the ordination method, sta crop, determined from total specimen and numbers collected, is used to indicate comm health. The most health situation was when s ing crops and niche partitioning were gre Data are summarized by collection date. Sta most stressed by industrial wastes were lo near the thermal discharge and the effects re to thermal discharge. Ordination was sensiti natural and man-made stresses caused by se ble solids. Seasonal trends in specimen and numbers of bottom fauna were observed greatest abundance occurred in August. Div index results contrasted with the ordination and no coherent interpretation was possible. tations stressed by industrial loading frequently projected as healthier than refe stations, therefore conclusions reached by di

ty index were rejected. (Buchanan-Davidson--Wisconsin)
W76-05636

DETERGENT PHOSPHATE BAN YIELDS LITTLE PHOSPHORUS REDUCTION, PART I,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
E. Etzel, J. M. Bell, E. G. Lindermann, and C. J. Lancelot.
Water and Sewage Works, Vol. 122, No. 1, p. 91-93, 1975. 5 fig., 4 tab., 11 ref.

Descriptors: *Detergents, *Analytical technique, Phosphates, *Rivers, *Legislation, Indiana, Eutrophication, Chemical analysis, Phosphorus compounds, Nitrogen compounds.
Identifiers: Wabash River(Ind.), White River(Ind.), Algal assay procedure, Legislative impact.

A study was made during the summer of 1974, to see if the Indiana State legislative ban on detergent phosphates had succeeded in making phosphorus a growth-limiting nutrient and consequently reducing eutrophication in the Wabash and White Rivers and their principal tributaries. Alternate biweekly water samples were analyzed for ortho and total phosphorus, nitrate-nitrogen, ammonia nitrogen, total Kjeldahl nitrogen, copper, magnesium, iron, sodium, calcium, and pH. Algal bioassays were also performed; spiking tests were done with phosphorus, nitrogen, and minor elements with EDTA were done using Selenastrum capricornutum as the test organism. Toxicity of water samples was also determined. Filamentous algae were assayed for the presence of surplus phosphorus. The results indicated that the legislative ban on detergent phosphates failed to reduce the remaining stream phosphorus to levels low enough to be of any biological significance in reducing the potential for algal growth. Flocculation at sewage treatment plants can be used effectively to reduce discharge of nutrients. An ancillary report on this investigation follows. (Buchanan-Davidson--Wisconsin)
W76-05637

DESCRIPTION OF THE TROPHIC STATUS AND NUTRIENT LOADING FOR LAKE GEORGE, NEW YORK,
Rensselaer Polytechnic Inst., Troy, N. Y. Fresh Water Inst.
J. Ferris, and N. L. Clesceri.
EPA Report 75-1, June 1975. 15 fig., 24 tab. EPA 16040J1p01527.

Descriptors: *Trophic level, *Lakes, New York, Biology, Human population, Vegetation, Computer models, Lake morphology, Energy budget, Limnology, Water balance, Light penetration, Phosphorus compounds, Silica, Nitrogen compounds, Productivity, Benthos, Varieties, Water temperature, Solar radiation, Phytoplankton, Biomass, Aquatic plant, Invertebrates, Fish, Organic matter, Zooplankton, Nannoplankton, Limiting nutrients.
Identifiers: *Lake George(N.Y.), *Phosphorus loading, CLEANX model, Nutrient budgets, Water detention time.

Geography, geology, vegetation, human population, water uses, sewage effluents, bathometry, hydrology, and limnology of Lake George, New York, are reviewed. Geologic history is the primary element determining the lake's present trophic status. Precipitation is the only source of hydrologic import. The basin is a headwater for the Lake Champlain catchment area. Phosphorus exports are characteristic of oligotrophic soils. The small basin:lake area ratio emphasizes the importance of precipitation on land surfaces a source of phosphorus and nitrogen loadings. No untreated sewage sources are known. Phosphorus loading estimates indicated that the lake is oligotrophic. The model CLEANX, describing the pelagic epilimnetic zone, was correct in using the loading approach to determine productivity. High spring nutrient loadings and winter thaws, plus rising temperature and solar radiation levels, cause increased phytoplankton biomass. Dissolved nutrients increase due to decomposer activity on runoff organic matter. Zooplankton followed by non-piscivores cropping reduces pressure on phytoplankton, but with lower summer nutrient concentrations, nannoplankton become dominant. Biomass and phytoplankton increase in August-September, preceding lake turnover. Comparison of biomass with model simulations indicated that modeling ecologic processes is sound and nutrient inputs from streams with subsequent internal recycling are the principal non-physical driving forces in the ecosystem. (Buchanan-Davidson--Wisconsin)
W76-05638

ALGAL NITROGEN FIXATION IN CALIFORNIAN STREAMS: SEASONAL CYCLES,
California Univ. Berkeley; and Clear Lake Algal Research Unit, Lakeport, Calif.
A. J. Horne, and C. J. W. Carmiggelt.
Freshwater Biology, Vol. 5, No. 5, p. 461-470, 1975. 5 fig., 2 tab., 23 ref.

Descriptors: *Algae, *Nitrogen fixation, *Streams, California, Seasonal, Cycles, Nostoc, Distribution, Growth rates, Nutrients, Water quality, Limiting factors.
Identifiers: *Rocky Creek(Calif.), Eel River(Calif).

Nitrogen-fixation by Nostoc in Rocky Creek, California was measured. Since 1970, nitrogen-fixation has varied seasonally and spatially; it was highest during early stages of colony growth in shallow, clear areas with little shade. The annual nitrogen-fixation rate was similar to the Arctic tundra, larger than for Antarctic rivulets, and less than for temperate rocky shores. A heterocystous Nostoc was the only organism responsible for this fixation. Nostoc occurred in gelatinous clumps of varying size on stable boulders where Ulothrix zonata also grew. Nitrogenase activity occurred as soon as Nostoc was present; in shaded areas activity was seasonally irregular and low. Nostoc was found throughout Rocky Creek and most adjacent stream but not in the main river, Eel River South Fork. A significant but small contribution to the nitrogen income of the nitrogen deficient Eel River system was due to nitrogen-fixation. Nostoc establishment appeared to be controlled by reduced turbulence, firm attachment to substrate. Nostoc colony disappearance in June was probably due to nutrient depletion. Opening the vegetation cover and admitting more light would encourage Nostoc growth but would reduce the high water quality in the Eel River system. (Buchanan-Davidson--Wisconsin)
W76-05639

PRODUCTIVITY AND BIOCHEMICAL COMPOSITION OF CHLORELLA AT DIFFERENT LEVELS OF ILLUMINATION AND NITROGEN LIMITATION,
Akademiya Nauk SSSR, Novosibirsk. Institut Fiziki.
V. N. Belyanin, E. K. Volkova, I. N. Trubachev, and I. M. Pan'kova.
Soviet Plant Physiology, Vol. 22, No. 1, p. 41-46, 1975. 4 fig., 1 tab., 20 ref. Trans. of Fiziologiya Rastenii, Vol 22, No. 1, 1974.

Descriptors: *Cytological studies, *Productivity, *Biochemistry, *Chlorella, *Limiting factors, Light intensity, Nitrogen, Growth rates, Biomass, Algae, Cultures, Inhibition, Carbohydrates, Proteins, Metabolism, Chlorophyll, Photosynthesis.

The effects of illumination on productivity, growth, and biochemical composition of dense cultures of Chlorella vulgaris during nitrogen limited cultures are described. Maximal biomass increase was the same at all illumination levels. Decrease in algal productivity, high illumination began when nitrogen was added. Protein synthesis was determined by available nitrogen supply. Decrease the amount of protein synthesized by cells was accompanied by decreased cell size. Prolonged cultivation under condition of nitrogen deficit showed periodic fluctuations in cell dimensions. The less nitrogen in the culture the greater the carbohydrate and protein content of the pericellular medium, due to more intensive cellular secretion and less intensive removal of metabolites. Lipids, volatile acids, and traces of pyroracemic acid were also present; free fatty acids, sterols, carotene, and chlorophyll were present in lipids. These changes in the medium caused changes accompanying microflora. Chlorella viability declined in conditions of nitrogen deficit. Nitrogen metabolism play a determining role in chlorophyll synthesis photosynthetic apparatus formation, and chlorella multiplicatioN. High illumination intensify inhibited photosynthesis and carbohydrate synthesis in cells within a wide range of nitrogen supply. Nitrogen deficiency caused active photosynthesis in algae and therefore partially compensated for the decreased photosynthesis caused by illumination. (Buchanan-Davidson--Wisconsin)
W76-05640

FECUNDITY OF THE BROWN BULLHEAD, ICTALURUS NEBULOSUS (LE SUEUR) IN A MINE ACID POLLUTED RIVER,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 8I.
W76-05641

ACCUMULATION AND ELIMINATION OF DIELDRIN BY CHANNEL CATFISH (ICTALURUS PUNCTATUS),
Iowa Cooperative Fishery Unit, Ames.
L. R. Shannon.
Available from the National Technical Information Service, Springfield, Va. 22161 $5.00 in paper copy, $2.25 in microfiche. PhD thesis, 1974. 87 p, 13 fig, 5 tab, 55 ref, 8 append. OWRT A-042-IA(3).

Descriptors: *Pesticide residues, *Dieldrin, *Fish, Fish diets, Channel catfish, Absorption, Exudation, Pesticide kinetics, Water, Size, Chlorinated hydrocarbon pesticides.
Identifiers: Excretion.

Dieldrin accumulation and elimination by channel catfish after exposure to dieldrin in water and food were studied in the laboratory. When 4-14 inch catfish were immersed 6 hours in a solution containing 18.8 ppb dieldrin, the highest uptake was in the dorsal muscle of 7-10 inch fish. Dieldrin elimination was slowest in 12-14 inch fish. When 6-9 and 14-16 inch fish were exposed to 75 ppt dieldrin for 28 days, larger catfish accumulated more dieldrin than smaller fish. After elimination for 28 days, dieldrin levels in both groups were about equal. Balance between uptake and excretion occurred in 56 days in muscles of 6 inch catfish exposed to 13 ppt dieldrin, and muscle exposed to 27 ppt were approaching balance. Catfish exposed to 2 ppm dieldrin in their diet accumulated more dieldrin than fish exposed to 75 ppt in water. When fish were exposed to dieldrin in both food and water, both sources contributed to the total load. Large catfish accumulated more dieldrin from food and water than smaller catfish. After elimination for 28 days, dieldrin levels were not significantly different in muscles of 6-9 inch and 14-16 inch catfish exposed to dieldrin in both food and water. (Buchanan-Davidson-Wisconsin).
W76-05642

ANTIMYCIN: BEYOND TELEOCIDE,
Wisconsin Univ., Madison.
Mary Ellen Antonioni.
Trans Wis Acad Sci Arts Lett. 62 p 285-301. 1974.

Descriptors: *Antimycin A, *Toxicity, *Clams, Temperature.
Identifiers: Elliptio Dilatatus, Fluorescein, Lampsilis Siliquoidea, Teleocide.

Two species of clams, Lampsilis siliquoidea and Elliptio dilatatus, were exposed to each of 4 dosage levels of antimycin (5, 10, 12, and 15 ppb antimycin/water) at 3 temperatures (17C, 22C, and 27C). Each temperature test constituted a 'run' of 27 days, during which the organisms were observed and dieoff recorded. The pH was a constant 7.5 and general water quality constant. At run 3 (27C), fluorescein dye (used as a tracer dye with antimycin) was also tested alone and in combination with 15 ppb antimycin. For both species, increase in dieoff as temperature increased was significant for 12 ppb and 15 ppb, but not for 5 or 10 ppb. There was an overall significant increase in dieoff as temperature increased. A comparison among 15 ppb antimycin, 15 ppb antimycin plus fluorescein; and fluorescein alone, yielded the following results: there was no significant difference in dieoff between the 15 ppb antimycin and 15 ppb antimycin plus fluorescein; there was no dieoff for fluorescein dye alone. The increase in dieoff with increasing temperature was significantly greater for L. siliquoidea than for E. dilatatus for dosages 5 and 10 ppb. The total number of dead individuals after 27 days was significantly greater for L. siliquoidea than for E. dilatatus at 22C and 27C, but not at 17C. -- Copyright 1975., Biological Abstracts, Inc.
W76-05662

DEVELOPMENT OF OXYGEN DEFICITS IN 14 SOUTHERN ONTARIO LAKES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
D. C. Lasenby.
Limnology and Oceanography, Vol. 20, No. 6, p 993-999, November 1975. 1 fig, 3 tab, 24 ref.

Descriptors: *Hypolimnion, *Oxygen demand, *Canada, *Secchi disks, *Seston, *Lakes, *Sediments, Summer, Respiration, Temperature, Areal, Productivity, Epilimnion, *Water pollution effects, Mesotrophy, Oligotrophy.
Identifiers: *Ontario(Canada).

Areal hypolimnetic oxygen deficits in 14 southern Ontario lakes developed linearly throughout summer in 13 of the lakes and decreased, usually linearly, as the upper limit of the hypolimnion was chosen at successively greater depths. The effect of this decrease on the calculated deficit was not great. Areal hypolimnetic oxygen deficit ranged from 0.006 to 0.041 mg/sq cm/day; it was not correlated with average dry weight of seston in summer but was correlated with average Secchi depth during summer. This range suggested that the 14 Ontario lakes can be classified as either mesotrophic or oligotrophic using Mortimer's limits. (Lardner-ISWS)
W76-05679

SENSITIVITY OF BLOOD CELL COUNTS IN JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) TO STRESSORS INCLUDING SUBLETHAL CONCENTRATIONS OF PULP MILL EFFLUENT AND ZINC,
B. C. Research, Ltd., Vancouver.
D. J. McLeay.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 12, p 2357-2364, Dec., 1975. 32 ref, 5 tab.

Descriptors: *Pulp wastes, *Zinc, *Water pollution effects, *Salmon, Wastes, Industrial wastes, Fish, Aquatic animals, Aquatic life, Water pollution sources, Toxicity.
Identifiers: *Coho salmon, Blood cells, White blood cells, White blood cells, Red blood cells, Sublethal effects.

Transfer of fish from optimal to high-temperature crowded holding conditions decreased white blood cell-thrombocyte (WBC-T) counts markedly on 12-96 hr exposure. Red blood cell (RBC) counts were increased only slightly at 12 and 48 hr. During 28 days acclimatization following transfer to simulated stream compartments, WBC-T counts returned to stock values within 2-4 days, following an initial decline. RBC counts were not altered appreciably. The decline in WBC-T counts ofacclimatized fish to a high sublethal concentration of bleached kraft pulp mill effluent was greatest at 24 hr. Mean RBC counts were decreased over 24-96 hr, but differences were significant at 24 hr only. In acclimatized fish exposed to pulp mill effluent, WBC-T counts were decreased at concentrations between 0.2 and 0.9 of the 96 hr LC(50). A 24 hr exposure to 15% voll of this effleutnt had considerably less effect on the WBC-T count whenefluent had been detoxified by foam fractionto. Under similar experimental conditions, exposure to sublethal lvels of zinc depressed mean WBC-T counts proportional to concentration, although differences were only significnt at 0.5 LC(50) and greater. RBC counts were unchanged. The WBC-T response provids a reasonably rapid and sensitive method for measuring stressful levels of pulp mill effluents to salmon. Declines in WBC-T counts are attributable to reduced numbers of circulating small lymphocytes, which could result in decreased resistance of stressed fishes to disease. (Witt-IPC)
W76-05696

EFFECT OF BLEACHED KRAFT MILL EFFLUENT ON THE SURVIVAL OF STARVED JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH),
B. C. Research Ltd., Vancouver.
D. A. Brown, and D. J. McLeay.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 12, p 2528-2530, Dec., 1975. 4 ref, 1 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Water pollution effects, *Fishkill, Wastes, Industrial wastes, Water pollution sources, Fish, Water pollution, Toxicity.
Identifiers: *Coho salmon, Sublethal effects, Kraft mills.

Starved coho salmon fingerlings were exposed to sublethal concentrations of neutralized bleached kraft mill effluent. The time to death was similar in the control group, in fish continuously exposed to effluent concentrations equivalent to 0.05-0.4 of the samples' 96-hr LC(50) values, and in fish exposed to a treated (foam-stripped) portion of the samples at a volume equivalent to 0.7 LC(50) for untreated effluent. Time to death decreased progressively in groups exposed to effluent concentrations higher than 0.4 of the 96-hr LC(50). (Witt-IPC)
W76-05710

COMPARATIVE TOXICITY OF POLYELECTROLYTES TO SELECTED AQUATIC ANIMALS,
National Water Quality Lab., Duluth, Minn; and Environmental Research Lab., Duluth, Minn.
K. E. Biesinger, A. E. Lemke, W. E. Smith, and R. M. Tyo.
Journal of the Water Pollution Control Federation, Vol. 48, No. 1, p. 183-187, January 1976. 4 tab, 9 ref.

Descriptors: *Polyelectrolytes, *Daphnia, *Rainbow trout, *Lake trout, Laboratory tests, *Lethal limit, *Toxicity, *Bioassay, Reproduction, Water quality control, Water pollution sources, Water pollution effects, Chemicals, Suspended solids, Methodology, Environmental effects, Aquatic animals.
Identifiers: Salvelinus namaycush, Sublethal effects, Mysis relicta, Limnocalanus macrurus, Median tolerance limits, Superfloc, Magnifloc, Gendriv.

The toxicity of selected polyelectrolytes to ra
bow trout (Salmo gairdneri), lake trout (Salvelin
namaycush), Mysis relicta, Daphnia magna an
copepod (Limnocalanus macrurus) was det
mined. The median tolerance limits in milligra
per liter ranged from less than 0.06(Mysis) to 2
(lake trout) for Superfloc 330, from 0.65 (Daphn
to greater than 8.0 (lake trout) for Calgon M-5
from less than 6.20 (Daphnia) to 218 (rainb
trout) for Gendriv 162, from 2.10 (Daphnia) to 8
(rainbow trout) for Magnifloc 521C, and from 1
(Daphnia) to greater than 8.0 (rainbow trout)
Magnifloc 905N. The TL-50's for Daphnia w
1.85 for Magnifloc 570C and 17.0 for Dow AP-
Superfloc 330 and Calgon M-500 impai
reproduction of Daphnia at low levels of conc
tration. (Katz)
W76-05740

EFFECT OF ENVIRONMENTAL FACTORS STANDING CROP OF PLANKTON IN BRIT COLUMBIA LAKES,
M. S. Topping.
Verhandlungen International Verein Limnolo
Vol. 19, p. 524-529, October 1975. 3 fig., 2 tab.
ref.

Descriptors: *Primary productivity, *Food cha
*Biomass, *Dissolved solids, *Lakes, *Nutrie
*Standing crops, *Productivity, *Temperat
Crop production, Trophic level, Seasonal, Sta
cal models, Solutes, Aquatic populations, Bio
cal communities, *Canada.
Identifiers: TDS, British Columbia.

Concentration of total dissolved solids (TDS
used as a simple measurement of nutrient su
and has been considered as an indicator of
productivity. Settled volumes of total quantit
plankton samples collected during spring and
summer from 27 fresh and alkaline lakes
29,987ppm TDS) were studied to define the e
of a widerange of TDS values on standing cro
evaluate the relative importance of TDS v
energy related and other environmental vari
and to investigate the role of TDS as a determ
of plankton productivity. Maximum standing
occurred at about 8,200ppm TDS during s
and about 70ppm TDS during late summe
lower concentrations TDS may indicate nu
concentration while at higher concentrations
same solutes may become osmotically limitin
pendent on temperature. TDS and energy re
variables appear to be equally important i
counting for differences in standing
throughout British Columbia. Difference
seasonal standing crop were a negative curvil
function of TDS. (Katz)
W76-05741

ACUTE TOXICITY OF A NATIVE M MICHOG POPULATION (FUNDU HETEROCLITUS) TO MERCURY,
Montclair State Coll., Upper Montclair, N.J.
of Biology.
J. Klaunig, S. Koepp, and M. McCormick.
Bulletin of Environmental Contamination
Toxicology, Vol. 14, No. 5, p. 534-536, 1975.
6 ref.

Descriptors: *Mercury, *Lethal limit, *To
*Estuaries, *Toxicants, *Heavy metals,
pollution sources, Water pollution ef
Estuarine fisheries, Fish, *Fish behavior, La
tory tests, Metals, Public health, Estu
Teleosts, Methodology.
Identifiers: Sublethal effects, Fu
heteroclitus, *Mummichog, Tolerance limits

The dose-response of native mumm
(Fundulus heteroclitus) populations to m
was determined using specimens obtained
Sandy Hook Bay, New Jersey. Test groups
healthy fish each were incubated for 96 h
one of 11 different dosages of mercuric ch
ranging from 0.23-4.6 mg/liter. Fish show

isible response to the toxicant in dosages up to .86 mg/liter. Sluggish behavior developed in fish urviving exposure levels above 1.15 mg/liter. Fish xposed to intermediate levels (1.15-2.0 mg/liter) eveloped uncoordinated swimming movements. ish exposed to maximal levels of the toxicant howed a marked increase in the opercular rate, eflecting respiratory stress. Death occurred ithin 24 hours of the initial exposure. (Katz)
/76-05742

HE EFFECT OF OXIDIZED MATERIAL ON HE VERTICAL DISTRIBUTION OF FRESH-/ATER BENTHIC FAUNA,
ate Univ. Coll., at Brockport, N.Y. Dept. of iological Science.
. B. Kirchner.
reshwater Biology, Vol. 5, p. 423-429, 1975. 1 g., 4 tab., 10 ref.

escriptors: *Benthic fauna, *Oligochaetes, Nematodes, *Diptera, *Distribution patterns, Benthos, Environmental gradient, Sediments, xidation, Methodology, Sampling, Water pollu-n effects.
entifiers: *Vertical distribution, Oxidized layer, duced layer.

e vertical distribution of representatives of the nthic groups: Ostracoda, Nematoda, igochaeta, Harpacticoida, Cyclopoida and ironomidae was determined. All groups had ir highest numbers and biomass in the first 2 . The downward extent of oxidized material af-ted the distribution by dispersing the biomass re, as seen by the deeper occurrence of groups en the oxidized material increased. Both the ne-todes and oligochaetes were found to inhabit first reduced layer when the oxidized material s less than normal. (Katz)
6-05743

ME OF THE EFFECTS OF DOMESTIC WAGE DISCHARGE INTO HICKMAN AND SSAMINE CREEKS IN JESSAMINE COUN-, KENTUCKY,
bury Coll., Wilmore, Ky.
primary bibliographic entry see Field 5B.
6-05841

COND ANNOTATED BIBLIOGRAPHY ON LOGICAL EFFECTS OF METALS IN UATIC ENVIRONMENTS,
ironmental Research Lab., Narragansett, R.I.
isler, and M. Wapner.
ilable from the National Technical Informa-Service, Springfield, Va 22161 as PB-248 211, 00 in paper copy, $2.25 in microfiche. Report -600/3-75-008, October 1975, 399 p. EPA 022;ROAP/Task No. 16 AAT/31.

criptors: Fishes, Cations, Salinity, *Metals, atic animals, Water pollution, *Toxicity, abolism, *Bibliographies, Radioisotopes, In-brates, Heavy metals, Trace elements, ter pollution effects, *Aquatic environment.
tifiers: Aquatic vertebrates, Trace metals, ental composition.

tal of 725 references are listed on the tox-gical, physiological, and metabolic influence able and radiolabelled chemical species of cations to marine, estuarine, and freshwater and flora. References were annotated and quently indexed by metal, by taxa, and by r, in cumulative indices which encompass olume and the initial volume in this series r, R. 1973. Annotated bibliography on biolog-ffects of metals in aquatic environments (No.). U.S. Envir. Prot. Agen. Rept. R3-73-007:). (EPA)
05863

ENVIRONMENTAL RESPONSES TO THERMAL DISCHARGES FROM MARSHALL STEAM STATION, LAKE NORMAN, NORTH CAROLINA,
Johns Hopkins Univ., Baltimore, Md. Dept of Geography and Environmental Engineering.
L. D. Jensen.
Available from NTIS, Springfield, Va., 22161, as PB-237 662, $8.00 in paper copy, $2.25 in microfiche. April 1974, 250 p, 142 fig, 92 tab, 153 ref, 4 append.

Descriptors: *Thermal pollution, *Environmental effects, *Aquatic environment, *Water quality, Productivity, Algae, Plankton, Fish, Benthos, Oxygen, Nitrogen, Nitrates, Cooling water, Animal diseases, Fungi, Water pollution effects, Seasonal, *North Carolina.
Identifiers: *Marshall Steam Station(NC), *Lake Norman(NC).

Physical and meteorological data on thermally stratified Lake Norman, North Carolina, were gathered and used in studies of the effects of water quality changes caused by the action of the Marshall Steam Station condenser cooling system on the lake's organic productivity, and plankton, benthic, and fish populations. Thermal effects of the heated water were insignificant overall but significant in the discharge area. Stimulation of algal growth by the effluent appeared to be prevented by limitations in solar penetration. Plankton populations showed strong seasonal variations, making it difficult to ascribe these changes to the action of the steam station. The number and diversity of benthic species collected in the effluent of the discharge station were lower than at the control stations. (See W76-05871 thru W76-05878) (Chilton-ORNL)
W76-05870

INTRODUCTION AND PHYSICAL DESCRIPTION OF LAKE NORMAN,
Johns Hopkins Univ. Baltimore, Md. Dept. of Geography and Environmental Engineering.
L. D. Jensen, D. K. Brady, and R. F. Gray.
In: Environmental Responses to Thermal Discharges from Marshall Steam Station, Lake Norman, North Carolina. p 1-6, April 1974 5 fig, 1 tab.

Descriptors: *Lakes, *Reservoirs, Limnology, Freshwater, Powerplants, Dams, North Carolina.
Identifiers: *Lake Norman(NC), Marshall Steam Station(NC), Physical description.

Lake Norman was formed in 1963 by the construction of a dam on the Catawba River in North Carolina. The lake has a shoreline of about 840 km and a surface area of 131 sq. km. Its total drainage area of approximately 4660 sq. km. yields a mean annual flow of about 75.5 cubic m/sec. Full pond surface elevation is 232 m above mean sea level. The mean depth at full pond is 10.3 m and the total volume of water stored is about 1.35 x 10 to the 9th power cubic meters. Average detention at the mean river flow rate is 207 days. Annual fluctuations in lake surface elevation range over approximately 3.6 m. Marshall Steam Station is located on the west shore of Lake Norman at the head of an extended cove. Cooling water is pumped through the plant's condensers and discharged at the head of a nearby downstream cove. The discharge point is about 1.5 km from the section where the cove adjoins the main longitudinal axis of the lake. Nineteen sampling stations are located in a segment of the lake which covers some 32 km between the upstream and downstream stations. (See also W76-05870) (Chilton-ORNL)
W76-05871

THERMAL AND WATER QUALITY CHARACTERISTICS OF LAKE NORMAN,
Johns Hopkins Univ., Baltimore, Md., Dept. of Geography and Environmental Engineering.
L. D. Jensen, D. K. Brady, R. F. Gray, W. D. Adair, and J. J. Hains.
In: Environmental Responses to Thermal Discharges from Marshall Steam Station, Lake Norman, North Carolina. p 7-119, April 1974, 54 fig. 48 tab.

Descriptors: *Limnology, *Thermal stratification, *Water quality, *Environmental effects, Aquatic life, Hypolimnion, Epilimnion, Oxygen, Nitrogen, Seasonal, North Carolina.
Identifiers: *Lake Norman(NC), Marshall Steam Station(NC).

A significant feature of the Marshall Steam Station interactions with Lake Norman is the skimmer wall used to withdraw hypolimnetic water during the stratified period (late April through October) of the year. Aquatic organisms are influenced by natural changes in thermal stratification and concurrent water quality influences, such as low dissolved-oxygen levels within the hypolimnetic layer, and by man-made changes in this stratification sequence. Since the cooling water originates in the hypolimnetic layer during the stratified period of the year, the combined thermal discharges are approximately equivalent to temperatures occurring as a result of daily and seasonal warming in the epilimnetic layers. Considerable dilution of the thermal effluent occurs in the mixing area and downlake with the result that water temperatures do not appear to be more than a few degrees above ambient upper layer temperatures. Dissolved oxygen levels in the discharge area and downlake mixing area appear to be influenced by the hypolimnetic water supply during the stratified period. Oxygen levels in the discharge area appear to be biologically limiting during these periods. During winter, the thermal elevations appear to result in increases of nitrogen saturation values in the thermal discharges. (See also W76 - 05870) (Chilton-ORNL)
W76-05872

PLANKTON POPULATIONS,
Johns Hopkins Univ., Baltimore, Md., Dept. of Geography and Environmental Engineering.
E. F. Menhinick, and L. D. Jensen.
In: Environmental Responses to Thermal Discharges from Marshall Steam Station, Lake Norman, North Carolina. p 120-138, April 1974, 14 fig, 1 tab.

Descriptors: *Limnology, *Thermal stratification, *Aquatic populations, *Environmental effects, Powerplants, Hypolimnion, Epilimnion, Phytoplankton, Zooplankton, Seasonal, North Carolina, *Distribution patterns.
Identifiers: *Lake Norman(NC), *Marshall Steam Station(NC).

Phytoplankton and zooplankton populations showed strong seasonal patterns of distribution during both the stratified (summer) and unstratified (winter) condition of the lake. The individual plankters had a relatively patchy distribution and were generally confined to the upper layers. The use of a skimmer wall at the steam station to retain these warm surface waters during stratified periods produced relatively different plankton populations between the intake cove and the rest of the lake. During the period when the lake was relatively isothermal, fewer differences between the intake cove and the rest of the lake populations were observed. Within the mixing area downlake, plankton populations were essentially similar to those uptake from the intake cove, and thus effects of the power plant were confined to the intake cove area. (See also W76-05870) (Chilton-ORNL)
W76-05873

PRIMARY PRODUCTION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. A. Smith, A. S. Brooks, and L. D. Jensen.
In: Environmental Responses to Thermal Discharges from Marshall Steam Station, Lake

Norman, North Carolina. p 139-147, April 1974, 8 fig, 3 tab.

Descriptors: *Limnology, *Environmental effects, *Thermal pollution, *Primary productivity, *Photosynthesis, Aquatic populations, Seasonal, Light penetration, North Carolina, Powerplants.
Identifiers: *Entrainment(Plankton), *Marshall Steam Station(NC), Lake Norman(NC).

Pump entrainment studies were conducted to determine changes in the rate of uptake of C 14 in phytoplankton populations occurring as a result of passage through the Marshall Steam Station cooling water condenser system. Comparisons of photosynthetic rates of intake samples incubated at intake temperatures with intake samples incubated at discharge temperatures suggested that there is little evidence of any loss of primary production capacity of either entrained or plume-entrained phytoplankton populations due to the operation of Marshall Steam Station. The data show photosynthetic rate changes varying from large increases in cooler months, to much smaller increases in warmer months. In contrast to results of similar studies at other power plants, the rates continued to be stimulated slightly at elevated temperatures even when Lake Norman temperatures reached the summer maximum. Limitations in light penetration appeared to effectively prevent the stimulations of algal populations in the downlake area from increasing to densities that would produce nuisance conditions. (See also W76-05870) (Chilton-ORNL)
W76-05874

THE EFFECT OF THERMAL DISCHARGE ON THE RATE OF ACCUMULATION OF ORGANIC SUBSTANCES ON GLASS SURFACES IMMERSED IN LAKE NORMAN,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
C. M. Weiss.
In: Environmental Responses to Thermal Discharges from Marshall Steam Station, Lake Norman, North Carolina. p 148-161, April 1974, 12 fig, 3 tab.

Descriptors: *Thermal pollution, *Environmental effects, *Organic matter, *Productivity, Sampling stations, Depth, Light penetration, Temperature, Seasonal, Limnology, North Carolina.
Identifiers: Marshall Steam Station(NC), *Lake Norman(NC).

Glass slides were hung at various depths at four representative stations in Lake Norman over a period of five years to evaluate the effects of thermal discharges from Marshall Steam Station on the accumulation of organic materials. Sampling stations were located on each side of the skimmer wall, at the mouth of the discharge cove, and downlake. Over the five-year period of exposure, seasonal changes in the rate of organic productivity were indicated but were most pronounced in the surface samples and decreased with depth. Net changes in water temperatures at the four stations and at four depths were noted in the comparison of the year-to-year record of organic accumulation averaged in two-month sequences. Increases in the rate of organic production appeared to be more related to depth (suggesting difference in light penetration) than to temperature. (See also W76-05870) (Chilton-ORNL)
W76-05875

ZOOPLANKTON ENTRAINMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. M. Davies, and L. D. Jensen.
In: Environmental Responses to Thermal Discharges from Marshall Steam Station, Lake Norman, North Carolina. p 162-172, April 1974. 16 fig, 6 tab.

Descriptors: *Environmental effects, *Thermal pollution, *Zooplankton, *Seasonal, Temperature, Cooling water, Powerplants, Movement, North Carolina.
Identifiers: *Entrainment(Plankton), *Marshall Steam Station(NC), Lake Norman(NC).

This study was concerned with an evaluation of the effects of pumped entrainment on zooplankton passing through the cooling water system of the Marshall Steam Station. Samples were collected at the intake and discharge of the power plant. Motility of organisms in the samples was usually correlated with the changes in water temperature from the intake to the discharge side and the ambient temperature of the water before it passed through the power plant. Linear regression lines for corrected percent motility(assumed to reflect only the effects of passage through the cooling system) versus ambient temperature and thermal elevation were drawn for dominant organisms, life stages of copepods, and major categories of zooplankton. Motility in discharge samples was related to both the amplitude of the thermal elevation and seasonal changes in ambient temperature. Motility of zooplankton in the discharge showed no significant decrease except at lower ambient winter temperatures. Large elevations above ambient water temperature in winter months appeared to be more damaging than lesser elevations during warmer periods that produce the same discharge canal temperature as zooplankton populations apparently become acclimated to lower ambient temperatures in the winter months. (See also W76-05870) (Chilton-ORNL)
W76-05876

BENTHIC INVERTEBRATES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. W. Koss, L. D. Jensen, and R. D. Jones.
In: Environmental Responses to Thermal Discharges from Marshall Steam Station, Lake Norman, North Carolina. p 173-186, April 1974. 10 fig, 3 tab.

Descriptors: *Environmental effects, *Thermal pollution, *Benthic fauna, *Aquatic populations, *Biomass, Productivity, Biota, Worms, Midges, Mayflies, Dragonflies, Caddisflies, Oligochaetes, Diptera, North Carolina.
Identifiers: *Species diversity, Chironomidae, Marshall Steam Station(NC), *Lake Norman(NC).

The Oligochaeta (worms) and Chironomidae (midges) were the most abundant benthic invertebrates found in Lake Norman with small populations of caddisflies, mayflies, and dragonflies also observed. Thermal effluents from Marshall Steam Station were not a negative influence on the benthic invertebrate fauna. Natural thermal stratification prevented the heated effluent from contacting any significant amount of the Lake Norman substrate even in the discharge canal. In the discharge canal and its near vicinity, the heated effluent does seem to have affected the character of benthic populations. Species diversity seems to have been lowered and the primary influence seems to be a slight increase in energy production at those shoreline and restricted subsurface areas that are influenced by the discharges from the plant. The thermal effluent seems to stimulate the populations of benthic invertebrates in these areas and do not seem to be damaging to the biota of the lake. (See also W76-05870) (Chilton-ORNL)
W76-05877

FISHERIES RESEARCH,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. W. Miller, and D. J. DeMont.
In: Environmental Responses to Thermal Discharges from Marshall Steam Station, Lake Norman, North Carolina. p 187-216, April 1974. 21 fig, 26 tab.

Descriptors: *Thermal pollution, *Environment effects, *Fish, *Temperature, *Dissolved oxyge Seasonal, Rough fish, Bass, Aquatic fun Nitrogen, North Carolina.
Identifiers: Fungus infections, Gas-bubble di ease, Marshall Steam Station(NC), *Lake Nc man(NC).

This study was undertaken to discover some wa in which the heated effluent from Marshall Stea Station affects the fishes of Lake Norman. Fi samples suggested that temperatures per se we not affecting abundance and well being of fish the discharge area. Dissolved oxygen concent tions in the discharge area were often below 1 m during the summer stratified period when surfa temperatures in the downlake mixing area were maximum seasonal levels, causing summer ca composition to be dominated by rough speci During winter months, dissolved oxygen conc trations approached air saturation and were longer a factor controlling fish abundance. Ga fish showed attraction for the discharge in win and spring with white bass abundance being po tively correlated with temperature increase abo ambient. In winter, conditions in the discha were conducive to fungus infections. Gas-bub disease caused by dissolved gas supersaturat (most likely nitrogen) resulted in fish mortaliti (See also W76-05870) (Chilton-ORNL)
W76-05878

RADIOLOGICAL AND ENVIRONMENT RESEARCH DIVISION ANNUAL REPORT ECOLOGY, JANUARY-DECEMBER 1974.
Argonne National Lab., Ill. Radiological and vironmental Research Div.
Available from the National Technical Infor tion Service, Springfield, Va 22161 as ANL-7 Part III, $4.00 in paper copy, $2.25 in microfic ANL-75-3. Part III (1975) 185 p. W-31-109-Eng-

Descriptors: *Ecology, Ecosystems, Path of po tants, *Research and development, Nuc powerplants, Watersheds(Basins), *Plutoni Sediments, Fish, Temperature, Lake Michig Migratory patterns, Limnology, Water pollu effects, Environmental effects.

Highlights of research accomplishments by Ecology Section during 1974 are given. Inclu are reports on a new program to assess behavior of plutonium in a watershed that received plutonium from a nuclear facility as as from fallout and a smaller program to deter the chemical and physical forms in w transuranic elements exist in natural waters. O programs include an investigation of the rol plankton in the processes of transport and rem of energy-related pollutants in the Great La Studies on the migratory behavior of salmo and on their temperature selection and resid times in thermal discharges are reported. W76-05880 thru W76-05902) (Chilton-ORNL)
W76-05879

ROLE OF COPEPOD FECAL PELLETS IN VERTICAL TRANSPORT OF FRESHWA DIATOMS,
Argonne National Lab., Ill. Radioological and vironmental Research Div.
J. G. Ferrante, J. I. Parker, and J. S. Marshall.
In: Radiological and Environmental Rese Division Annual Report Ecology, January thr December, 1974. p 1-8, 1975 8 fig, 8 ref. W-31- Eng-38.

Descriptors: *Environmental effects, *Sedi transport, Sediments, *Copepods, *Diat Freshwater, Zooplankton, *Lake Michigan, W pollution effects, Lake sediments, Lakes.
Identifiers: Transport mechanism, *Fecal lets(Copedods), Frustules.

Copepod fecal pellets were collected from va strata of Lake Michigan to study their signific

s a vertical transport mechanism for pelagic iatoms. Copepod fecal pellets were found to have relatively impermeable peritrophic membrane vhich retarded the rate of dissolution of diatom ragments as the pellets sank. Photomicrographs ndicated that bacterial decomposition of the membrane exposes the frustules to dissolution and ventual dispersion in the water column. It was oncluded that zooplankton fecal pellets are an important mechanism for accelerated transport of iatom frustules from the epilimnion of the lake. Most of the pellets do not become incorporated inact in the permanent sediments. Zooplankton razing fractures most ingested diatom frustules, nd subsequent bacterial degradation of eritrophic membrane exposes the fragments to ssolution within the water column. (See also 776-05879) (Chilton-ORNL)
776-05880

ERTICAL TRANSPORT OF PARTICULATE ATERIAL IN LAKE MICHIGAN BY THE ORICA OF CODONELLA CRATERA,
rgonne National Lab., Argonne, Ill. Radiological nd Environmental Research Div.
I. Parker, and J. G. Ferrante.
: Radiological and Environmental Research ivision Annual Report-Ecology, January through ecember 1974. p 9-12, (1975). 3 fig, 7 ref. W-31-9-Eng-38.

escriptors: *Environmental effects, *Sediment ansport, *Diatoms, Zooplankton, Freshwater, diments, Particle size, Lake Michigan, Lake diments, Lakes.
entifiers: Transport mechanism, *Codonella atera, Lorica.

vestigations into the abundance and distribution Codonella cratera showed a range from 16 ornisms per liter in surface waters to 6 organisms r liter in deeper waters. Approximately 3.0 oplankton crustaceans were observed in the me surface water samples. Particle size of reign material attached to or imbedded within e matrix of the lorica of Codonella ranged from s than 1.0 micron to a maximum size of 10.0 crons. The upper limit of particle size in all lorn observed was uniform. The major group of parles were mineral fragments while the secondary oup constituted whole diatom frustules and fragents of frustules. Codonella are smaller than st zooplankton but they were found in greater mbers during certain seasons. Occurrence of the tom-containing lorica in sediment illustrates t Codonella remove diatoms from the water lumn. The particulate material on the lorica may important as sorptive sites for transport of toxic terials from the surface water. (See also W76-374) (Chilton-ORNL)
76-05881

STRIBUTION OF DIATOM FRUSTULES IN KE MICHIGAN SEDIMENT CORES,
gonne National Lab., Argonne, Ill. Radiological l Environmental Research Div.
. Parker, and D. N. Edgington.
Radiological and Environmental Research vision Annual Report-Ecology, January through cember 1974. p 13-18, (1975). 2 fig, 1 tab, 18 ref. 31-109-Eng-38.

scriptors: *Environmental effects, *Diatoms, ophic level, *Cores, Freshwater, Silica, Samg, Recycling, Sediments, Lake Michigan, Lake iments, Lakes, Distribution patterns.
ntifiers: Frustules.

objectives were to measure the concentration diatom frustules in Lake Michigan sediment es and to consider their role in silica recycling. concentration of diatom frustules was meaed as a function of depth in 14 selected sedit cores. The concentration of frustules in surl sediment varied between 0.08 and 4.95% dry ght in nearshore and offshore samples, respectively. It did not appear that floristic changes in sediment frustules could be used as an indicator of trends or changes in trophic status for Lake Michigan over the last 100 years. The similar vertical profiles of diatom concentrations at all stations suggested that an active silica dissolution process has been occurring in both the water column and the sediment for that length of time. Reduced dissolved silica concentrations in the surface water may be the result of increased diatom standing crop. The sediment does not seem to be an effective sink for amorphous silica in the form of diatom frustules. Investigations of the processes of diagenesis and concentration of silica in interstitial water are in progress. (See also W76-05879) (Chilton-ORNL)
W76-05882

DISTRIBUTION OF AMORPHOUS, DIATOM FRUSTULE, AND DISSOLVED SILICA IN A LEAD-210 DATED CORE FROM SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
J. A. Robbins, D. N. Edgington, and J. I. Parker.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 19-31, (1975). 4 fig, 1 tab, 20 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Silica, *Distribution, *Sediments, *Cores, Diatoms, Lead, Models, Lake Michigan, Lake sediments, Lakes, Distribution patterns.
Identifiers: *Frustules.

In order to assess the effect and significance of dissolution of frustule silica and to compare regeneration of interstitial silica from biogenic phases with contributions from solution of clay minerals, Pb210 and amorphous, diatom, and dissolved silica were measured in the same sediment core. The Pb210 data indicated an unsupported level of about 0.9 pCi/g and some flattening of the activity within the upper 2.5 cm. Examination of the frustule silica distribution showed no comparable flattening within this interval and it was concluded that mixing had occurred in the core but that frustules were partially immune to its effects. The dissolved silica concentrations several centimeters below the sediment surface rose by roughly 100 over concentrations of a few tenths ppm in overlying water. Interstitial silica concentrations were shown to be maintained by interaction of clay minerals with silica produced by the dissolution of frustules and by diffusion. Diffusion reaction models for understanding the processes controlling the distribution of silica among sedimentary components are discussed. (See also W76-05874) (Chilton-ORNL)
W76-05883

STABLE LEAD GEOCHRONOLOGY OF FINE-GRAINED SEDIMENTS IN SOUTHERN LAKE MICHIGAN,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05884

GEOCHRONOLOGY OF LAKE MICHIGAN SEDIMENTS: ANOMALIES IN LEAD-210 DISTRIBUTIONS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5B.
W76-05885

MIAMI RIVER WATERSHED PROJECT: INTRODUCTION,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05886

PLUTONIUM CONCENTRATIONS IN WATER AND SUSPENDED SEDIMENT FROM THE MIAMI RIVER WATERSHED, OHIO,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05887

PLUTONIUM IN AQUATIC BIOTA OF THE GREAT MIAMI RIVER WATERSHED, OHIO,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
C. W. Wayman, G. E. Bartelt, and D. N. Edgington.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 78-86, (1975). 1 fig, 4 tab, 16 ref. W-31-109-Eng-38.

Descriptors: *Plutonium, *Food chain, *Aquatic environment, Biota, Fish, Algae, Pondweeds, Carp, *Ohio, Environmental effects.
Identifiers: *River ecosystems, *Miami River Watershed Project(Ohio), Goldfish, Cladophora.

Analyses were made of plutonium concentrations in Cladophora sp., Potamogeton sp., goldfish, carp, and miscellaneous cyprinids collected from the Miami River from June to August, 1974. Based on these analyses, there appeared to be discrimination against plutonium moving up in the food chain. Concentration of plutonium by algae and macrophytes is 100 to 1000 that of fish. An average of 80% of Pu238 found in carp is associated with the gastrointestinal tract and contents. Consequently, the plutonium located in the fish muscle is minimal. Since plutonium uptake by Cladophora sp. is thought to be rapid and dependent on the immediate concentration in the water, a single release of plutonium could be monitored by Cladophora sp. Uptake of Pu238 by fish occurs over a longer period of time and would not be significantly influenced by a single effluent release. (See also W76-05879) (Chilton-ORNL)
W76-05888

THE CHEMICAL SPECIATION OF PU-239, PU-240 AND CS-137 IN LAKE MICHIGAN WATERS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05889

EFFECT OF MUNICIPAL TREATMENT PROCESSES ON PU-239, PU-240, AND CS-137,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5F.
W76-05890

SEDIMENTARY PU-239, PU-240 PHASE DISTRIBUTIONS IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05891

THE DISTRIBUTION OF PLUTONIUM IN LAKE MICHIGAN SEDIMENTS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W76-05892

DEVELOPMENTS IN UNDERWATER RADIOTELEMETRY AND PRELIMINARY FISH TRACKING IN THERMAL PLUMES,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
W. Prepejchal, J. Haumann, and S. A. Spigarelli.

In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974, p 128-132, (1975), 1 fig, 3 ref. W-31-109-Eng-38.

Descriptors: *Thermal pollution, *Salmonids, *Physiological ecology, *Data transmission, Fish, Monitoring, Temperature, Telemetry.
Identifiers: *Behavioral thermoregulation, Tracking, Transmitters.

Fish were collected from thermal discharge sites, fitted with transmitters and released back into the flume. Fish location as well as physical and physiological parameters were monitored. During the tracking time, fish often moved through large temperature gradients in passing from ambient to plume water. Limited tracking of rainbow trout showed little or no evidence of behavioral thermoregulation but did demonstrate the ability of adult salmonids to traverse large temperature gradients with no great effect on internal body temperature. (See also W76-05879) (Chilton-ORNL)
W76-05893

COMPARISON OF THE MOVEMENT AND RECAPTURE OF SALMONID FISHES TAGGED AT TWO POWER PLANTS,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
G. P. Romberg, and M. M. Thommes.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 133-142, (1975), 7 fig, 3 tab, 5 ref. W-31-109-Eng-38.

Descriptors: *Thermal water, *Salmonids, *Migratory patterns, *Nuclear powerplants, Fish, Seasonal, Sites, Tagging, Fish populations, Salmon, Trout, *Thermal pollution.
Identifiers: Point Beach Nuclear Plant, Waukegan Power Plant.

The fish tagging program was directed at determining whether there were any seasonal or site specific differences in the residence behavior of salmonids at thermal discharges. It was concluded that there were differences in the abundance and time of peak abundance at the two power plant discharges. Because of this difference in timing, certain species reacted differently to the two discharges probably as a result of maturity and water temperature. Salmonids did not appear to remain at either discharge for long periods and many of those fish migrating away were caught at other power plant discharges. Direction of migration was affected by stocking location and water temperature. Differences in the annual migratory behavior of brown trout and rainbow trout affected the proximity of these fish to Point Beach. (See also W76-05879) (Chilton-ORNL)
W76-05894

ORIGIN OF FIN-CLIPPED SALMONIDS COLLECTED AT TWO THERMAL DISCHARGES ON LAKE MICHIGAN,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
G. P. Romberg, M. M. Thommes, and S. A. Spigarelli.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 143-149, (1975). 4 tab, 5 ref. W-31-109-Eng-38.

Descriptors: *Migration patterns, *Salmonids, *Marking techniques, Tagging, Stocking, Salmon, Trout, Lake Michigan, Thermal pollution.
Identifiers: Point Beach Nuclear Plant, Waukegan Power Plant

Fin-clip marking procedures were used to provide insight into fish migration patterns. Data on fish collected at discharges and creel cesus data were tabulated by species. The data on lake trout suggested that most of these fish captured at the two power plant discharges were stocked in that general area of the lake and often returned to the stocking location prior to spawning. In the case of rainbow trout, the majority of identified clips could be accounted for by Wisconsin stockings. The occurrence of several clips stocked in Indiana and Michigan indicates that some rainbow trout migrate considerable distances from their origin. The data on brown trout suggested stockings to the north of Point Beach and Waukegan. Relatively few coho salmon were collected at Point Beach and none bore fin-clips. Of the 182 coho collected at Waukegan in 1974, three were fin-clipped. (See also W76-05879) (Chilton-ORNL)
W76-05895

EFFECTS OF SEASON, LOCATION, AND DISCHARGE TYPE ON FISH DISTRIBUTION AND DENSITY IN THERMAL PLUMES,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
W. Prepejchal, G. P. Romberg, and S. A. Spigarelli.
In: Radiological and Environmental Research Division Annual Report - Ecology, January through December 1974. p 150-154, (1975) 1 tab, 6 ref. W-31-109-Eng-38.

Descriptors: *Thermal water, *Seasonal, *Distribution, *Sites, Migration patterns, Fish, Salmonids, Forage fish, Lake Michigan, Contours, Depth, *Thermal pollution.
Identifiers: Point Beach Nuclear Plant, Waukegan Power Plant, Zion Station.

Techniques used in this investigation involved a combination of standard plume mapping and sonar procedures. For each study the density of fish in the plume areas and reference areas were compared in terms of total area density, distribution relative to bottom depth, depth in the water column, and water temperature. Overall fish density indicated low densitiy in all areas in April, maximum density in May and June (attributed to alewives migrating inshore to spawn) and reduced densities during July through October. During the salmonid spawning periods there was no evidence of increased density of salmonids in the plumes. Site comparisons showed that Point Beach had higher plume density in May and June while Waukegan and Zion had higher plume density from July through September. There was no striking trend in fish distribution relative to bottom depth and depth stratum but there were subtle differences between dates and locations, reflecting differential responses with time, species, and discharge type. (See also W76-05879) (Chilton-ORNL)
W76-05896

CHARACTERISTICS OF TEMPERATURE-SENSITIVE FISH TAGS USED IN 1974,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
G. P. Romberg, and W. Prepejchal.
In: Radiological and Environmental Research Division Annual Report - Ecology January through December 1974. p 155-160, (1975) 3 fig, 4 ref.

Descriptors: *Marking techniques, *Temperature, *Fish, *Tagging, Irradiation, Thermal stress, Thermal pollution.

Special order Teflon rods containing 8% CaS04:Mn by weight were manufactured for use as predosed thermoluminescent dosimeters (TLD's). The TLD's were used for determining maximum discharge residence time and indications of integrated average temperature exposure. Previously used TLD fish tags exhibited individual variability and a nonlinear relationship between temperature and fade response which limited their application. The relationship between fade response of the tags used in the 1974 study and temperature was more clearly defined through the use of additional laboratory controls. The varia tion between rods was far greater than th specified 4% maximum range for weight and ligh response. This high variability masked sma reductions in variability due to improved method (See also W76-05879) (Chilton-ORNL)
W76-05897

DISCHARGE RESIDENCE OF TLD TAGGE FISH,
Argonne National Lab., Argonne, Ill. Radiologic and Environmental Research Div.
G. P. Romberg, and W. Prepejchal.
In: Radiological and Environmental Researc Division Annual Report - Ecology, Janua through December 1974. p 161-163, (1975) 1 fig, ref.

Descriptors: *Thermal water, *Marki techniques, *Temperature, Salmonids, Taggin Creel census, Data collections, Lake Michiga Thermal pollution.
Identifiers: *Residence times, Point Bea Nuclear Plant.

A total of 522 fish were collected from t discharge flumes and tagged with temperatu sensitive tags. Tagged fish were recaptured fr the discharge by selective spearing, from fish men, and from personnel conducting a creel c sus. Of 122 temperature-sensitive tags recaptur only 43 were obtained soon enough after recapt to be properly stored for analysis. Prelimin analysis indicated that calculated maxim discharge esidence for these fish will be nea 100% of the elapsed time. Brown trout appeared have had longer residence in warmer water t did rainbow trout. Lower discharge temperatu during 1974 (12.4 to 18.8 degrees C) compared 1973 (18.7 to 25.1 degrees C) are closer preferred salmonid temperatures and may acco for the apparent longer residence times for fish 1974. (See also W76-05879) (Chilton-ORNL)
W76-05898

BODY TEMPERATURE CHANGE CHARA TERISTICS OF LAKE MICHIGAN FISHES,
Argonne National Lab., Argonne, Ill. Radiolog and Environmental Research Div.
S. A. Spigarelli, M. M. Thommes, and T. L. Beitinger.
In: Radiological and Environmental Resea Division Annual Report - Ecology, Janu through December 1974. p 164-168, (1975) 3 fi tab, 4 ref. W-31-109-Eng-38

Descriptors: *Fish, *Temperature, *Stabilizat *Thermal water, Trout, Carp, Size, Weight, C ing, Heating, Lake Michigan, Thermal pollutio
Identifiers: Body temperature, Change ra Alewife.

The rates of body temperature change and half-time for temperature stabilization were ca lated for 5 specie of fish: alewife, brown t rainbow trout, brook trout, and carp. Relat ships between half-time, weight, and species reported. Increases in size resulted in increa half-times. Mean heating half-times of each sp were smaller than their corresponding mean c ing half-times. The temperature change rate i lated to fish size, species and direction of cha (See also W76-05879) (Chilton-ORNL)
W76-05899

BODY TEMPERATURES OF FISH FEEDIN THE POINT BEACH THERMAL DISCHARG
Argonne National Lab., Argonne, Ill. Radiolo and Environmental Research Div.
S. A. Spigarelli, and M. M. Thommes.
In: Radiological and Environmental Rese Division Annual Report - Ecology, Jan through December 1974. p 169-172, (1975) 1 t ref. W-31-109-Eng-38

Descriptors: *Thermal water, *Temperature, *Fish, Measurement, Lake Michigan, Thermal pollution.
Identifiers: Feeding, Body temperature, *Thermoregulation, Point Beach Nuclear Plant.

Records were made on 1310 fish of fish weight, length, sex and internal body temperature at time of capture; and of intake and discharge temperatures at that time. Mean monthly body temperatures indicated both temporal and taxonomic differences in feeding temperatures. In most cases, body temperatures were higher than intake temperatures indicating that feeding fish were either warming after recent movement from ambient waters into the plume or thermoregulating at selected intermediate temperatures. Measurements of fish body temperature showed that, under most conditions, fish were not equilibrated to maximum discharge temperatures. (See also W76-05879) (Chilton-ORNL)
W76-05900

GROWTH OF PLUME RESIDENT FISHES IN LAKE MICHIGAN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
L. A. Spigarelli, and D. W. Smith.
ANL-31-109-Eng-38. In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 173-179, (1975) 1 fig, 2 tab, 10 ref.

Descriptors: *Thermal water, *Growth rates, Salmonids, Fish, Trout, Lake Michigan, Chinook, Thermal pollution.
Identifiers: Residence times, Growth indicators, RNA-DNA ratio, Feeding regimes, Thermoregulation, Point Beach Nuclear Plant.

The technique of using RNA-DNA ratio as an indicator of growth was applied to studies of growth effects on thermal discharge 'resident' fish. The data suggested that plume brown trout were growing at a faster rate than average control brown trout; plume rainbow trout were growing at a similar rate to control rainbows; and plume chinook resembled the slowest growing control group. In general, K-factors indicated that plume fish were in similar condition to control fish. The fact that these fishes were exposed to elevated temperatures for varying periods of time indicates that this discharge does attract salmonids under certain conditions during the fall, but that accelerated metabolic demands are compensated by food availability and the ability of motile fish to regulate their temperature exposures behaviorally. (See also W76-05879) (Chilton-ORNL)
W76-05901

EFFECT OF PLUME RESIDENCE ON THE ACCUMULATION OF CS137 BY LAKE MICHIGAN SALMONIDS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
L. A. Spigarelli, and J. Edwards.
ANL-31-109-Eng-38. In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 180-183, (1975) 1 tab, 7 ref.

Descriptors: *Cesium, *Salmonids, Radioisotopes, Fallout, Fish, Trout, Chinook, Lake Michigan, Thermal pollution.
Identifiers: *Plume residence, Point Beach Nuclear Plant.

Brown trout, rainbow trout, and chinook salmon were collected, tagged with temperature-sensitive dyes and released into the discharge area. Upon capture, measurements of Cs137 were made on the fish. Comparisons between plume resident fish and reference fish were made using covariance techniques (fish weight as covariate). The relationship between exposure time and Cs137 activity was tested by linear regression analysis. Brown trout and chinook salmon had significantly higher concentrations of Cs137 than rainbow trout. The differences were thought to be the result of differential feeding habits or trophic position rather than a reflection of plume exposures since these same trends were evidenced in reference samples. (See also W76-05879) (Chilton-ORNL)
W76-05902

CONTAMINATION OF FRESHWATER BY MN54 AND CO60,
Commission of the European Communities, Brussels (Belgium); and Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).
C. Nicolas, and R. Kirchmann.
Available from the National Technical Information Service, Springfield, Va 22161, as EUR 5167E, $4.00 in paper copy, $2.25 in microfiche. Buratom 095-72-1 BIOB. EUR 5167 e, (197). 35 p, 18 fig, 6 tab, 10 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Radioisotopes, Freshwater fish, Cobalt, Manganese, Minnows, Nuclear powerplants, Europe.
Identifiers: *Meuse River.

Minnows inhabiting the Meuse River (which receives radioactive wastes from nuclear power plants) were examined for contamination by Co60 and Mn54. Both radioisotopes entered live fish rapidly with maximum contamination being reached within a few days after fish-radioisotope contact. Fed fish accumulated more of both radioisotopes and at a faster rate than did starving fish. Take-up of both Mn54 and Co60 by dead fish was ten times the take-up by live fish, probably due to the lack of regulating mechanisms which exist in live fish. The contamination curve for dead fish was more regular than that for live fish. No peak of activity was registered during a 16 day contamination period. Activity distribution in organs was studied, Mn54 was retained primarily in external organs while Co60 is taken up by the kidneys and genital tracts. When compared on a weight basis, muscles were relatively little contaminated. (Chilton - ORNL)
W76-05903

EFFECT OF CACODYLIC ACID AND MSMA ON MICROBES IN FOREST FLOOR AND SOIL,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
W. B. Bollen, L. A. Norris, and K. L. Stowers.
Weed Science, Vol. 22, No. 6, p 557-562, November 1974. 4 fig, 3 tab, 22 ref.

Descriptors: *Arsenicals(Pesticides, *Toxicity, Herbicides, Forest management, *Forest Soils, Brush control, Arsenic compounds, Bacteriacides, Organic matter, *Soil microorganisms, Carbon dioxide.
Identifiers: Carbon dioxide evolution, *Cacodylic acid.

Cacodylic acid (hydroxydimethylarsine oxide) and MSMA (monosodium methanearsonate) gave slightly visible inhibition of bacterial growth in pure culture at 1000 mg/L arsenic and moderate inhibition at 10,000 mg/L arsenic. There were no effects at 100 mg/L arsenic. Carbon dioxide evolution from three kinds of forest floor declined with increasing concentrations of MSMA and cacodylic acid. Increasing concentrations of MSMA caused an increase in carbon dioxide evolution from soil but cacodylic acid had no effect. Concentrations less than 10 mg/kg arsenic forest floor including L, F, and H horizons, or soil had no pronounced effect on organic matter decomposition. (Forest Service)
W76-05940

MIREX RESIDUES IN SELECTED ESTUARIES OF SOUTH CAROLINA: JUNE 1972,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.

For primary bibliographic entry see Field 5A.
W76-05954

LAKE WINGRA, 1837-1973: A CASE HISTORY OF HUMAN IMPACT,
Univ. Wis., Madison, Wisconsin Univ., Madison.
P. C. Baumann, J. F. Kitchell, J. J. Magnuson, and T. B. Kayes.
Trans Wis Acad Sci Arts Lett. 62: 57-94. Illus. 1974.

Descriptors: *Ecosystems, Eutrophication, Wisconsin, Lakes, History, Bass, Bluegill, Macrophytes, Perch, Pike.
Identifiers: Milfoil, *Lake Wingra(Wisc).

Lake Wingra is a shallow, eutrophic lake bordered on one side by the city of Madison and on the other by the University of Wisconsin Arboretum. The history of the biological and hydrographic changes which occurred in the lake between 1837-1973 is recounted. In the early 1900's, the area, depth and drainage patterns of the lake and adjoining wetlands were extensively altered by the activities of man. Early management practices (e.g. introduction of carp in the late 1800's, fish rescue and stocking operations during the 1930's and carp removal programs during the 1930's, 1940's and 1950's) had marked and often unexpected effects. The lake once had extensive bordering marshes, diverse aquatic macrophyte communities and large northern pike and yellow perch populations. It now has few connecting marshes, dense stands of Eurasian water milfoil ans is dominated by stunted bluegill and yellow bass. The number of macroinvertebrate species has been reduced; many larger forms have been eliminated. Since 1969, Lake Wingra and its watershed have been a major study site of the International Biological Program. Ecosystem concepts derived from this project and the lessons of history may facilitate more ecologically sound management decisions.--Copyright 1975, Biological Abstracts, Inc.
W76-05997

BRACKISH-WATER PHYTOPLANKTON RESPONSE TO TEMPERATURE ELEVATION,
Woods Hole Oceanographic Institution, Mass.
E. J. Carpenter.
Estuarine Coastal Mar Sci. 1(1): 37-44. 1973.

Descriptors: *Phytoplankton, Plankton, *Brackish water, Powerplants, Temperature, *Heated water, Thermal pollution, North Carolina, Dinoflagellates.
Identifiers: Pamlico River(NC).

An experiment was carried out to determine the effects of a temperature increase on the composition of brackish-water phytoplankton populations. Treatments were partitioned in duplicate and results were tested at the 95% confidence level with a randomized-block analysis of variance. The studies were made between 9 Feb.-18 April 1970 in four 14-m3 plastic pools located adjacent to the Pamlico River estuary, North Carolina, USA. Temperatures in the 2 control pools ranged from 5-19C and in heated pools from 10-27C during the study. Heated pools averaged 5.5C warmer than unheated. The only statistically significant effect noted on phytoplankton class composition was an increase in the dinoflagellate cell concentrations in the heated pools. Phytoplankton populations in the heated pools were more diverse and were composed of larger cells (cells averaged 5.2 times larger in volume) than in controls. It appeared that the warming tended to accelerate the succession of the late winter-early spring population and produced a more mature successional stage. Thus the warming of brackish water, possible by heated effluents form electric generating plants, can alter the composition of phytoplankton populations.--Copyright 1975, Biological Abstracts, Inc.
W76-05999

TEMPERATURE OPTIMUM OF ALGAE LIVING IN THE OUTFALL OF A POWER PLANT ON LAKE MONONA,
Wisconsin Univ., Madison.
T. D. Brock, and J. Hoffmann.
Trans Wis Acad Sci Arts Lett. 62: 195-203. Illus. 1974.

Descriptors: *Algae, Cladophora, Lakes, Outlets, *Powerplants, *Heated water, Thermal pollution, Temperature, Photosynthesis.
Identifiers: Lake Monona, Oscillatoriaceae, Stigeoclonium, Ulothrix, Yahara River.

Temperature optima for photosynthesis were measured for algal populations living in the outfall of an electric power plant on Lake Monona and were compared with the temperature optima of algae living in a control area in the nearby Yahara River. The temperature of the power plant outfall averaged about 8C higher than that of the Yahara River. In the winter, no differences in species composition between the 2 study areas could be detected, Cladophora and Ulothrix being the dominant algae. The temperature optima of the populations from the 2 locations were the same, around 27C, although the habitat temperatures at both locations were considerably lower. The only difference in response to temperature seen between the 2 populations was that the population at the outfall was able to photosynthesize at higher temperature, still showing high photosynthesis at 35C and detectable photosynthesis at 46C, a temperature at which the population from the Yahara River showed no detectable photosynthesis. In the summer, the dominant algae at the power plant outfall were Stigeoclonium and filamentous blue-green algae (family Oscillatoriaceae), whereas at the Yahara River the algal population was almost exclusively Cladophora. The temperature optima of both summer populations were the same, 31.5C, only slightly higher than the mid-winter optima. Again, the population from the power plant was able to photosynthesize at higher temperature than the control population, showing quite active photosynthesis at 42.5C, a temperature at which the population from the Yahara River was completely inactive. These results are discussed in relation to the possible environmental impact of power plants on Wisconsin lakes and rivers.--Copyright 1975, Biological Abstracts, Inc.
W76-06001

NEMATODES OF LAKE BALATON: IV. SEASONAL QUALITATIVE AND QUANTITATIVE CHANGES,
Research Inst. for Water Resources Development, Budapest (Hungary). Water Quality and Technology Dept.
K. Biro.
Ann Inst Biol (Tihany) Hung Acad Sci. 40: 135-158. 1973.

Descriptors: *Nematodes, *Lakes, *Lake beds, Seasonal, Fluctuations, Europe, Lake sediments.
Identifiers: Ironus-tenuicaudatus, Lake Balaton, Monhystera-paludicola, Paraphanolaimus-anisitsi, Paraphanolaimus-behningi, Paraplectonema-pedunculatum, Theristus-setosus, Hungary.

In the open-water sediment of Lake Balaton the following nematodes predominated during 1966-68: Paraplectonema pedunculatum S. (20%), Paraphanolaimus behningi M. (20%), Ironus tenuicaudatus dM. (19%), Theristus setosus (B.) M. (17%), Monhystera paludicola dM. (15%). Their occurrence varies by seasons: during winter (between 4-12C) T. setosus and M. paludicola are the most frequent species, while during summer they are absent at some places. A rare species, P. anisitsi (D.) Andrassy 1968 was also observed in the sediment of the lake. The highest number of nematodes was found in spring (May), 60-80,000 i (individuals)/m2, there was a gradual decrease during summer 10-20,000 i/m2, then from the middle of autumn (October) there was an increase again. During winter 100,000 i/m2 nematodes were observed under the ice at Tihany. The biomass of nematodes varied between 4-20 mg/m2. Generally this value is nearly twice as high in spring as in summer, it is the lowest usually in early autumn (4-6 mg/m2) and then slowly increases. The highest value of biomass was found at Balatonszemes. On the basis of the benthic fauna, Lake Balaton can be divided into 3 regions; the northeastern basin, the Keszthely-Bay and the central part of the lake.--Copyright 1975, Biological Abstracts, Inc.
W76-06004

OCCURRENCE OF PHYTOPHTHORA SPECIES AND OTHER POTENTIAL PLANT PATHOGENS IN RECYCLED IRRIGATION WATER,
California Univ., Berkeley. Dept. of Plant Pathology.
S. V. Thomsom, and R. M. Allen.
Plant Dis Rep. 58(10): 845-949. 1974.

Descriptors: *Arizona, *Recycling, *Irrigation water, *Pollutant identification, Citrus, Plant pathology, Phytoxicity, Seasonal, Fungi.
Identifiers: Pathogens, Phytophthora-Citrophthora, Phytophthora-Parasitica, *Phytophthora-Spp.

Sieves and citrus leaf baits were used to isolate Phytophthora parasitica, P. citrophthora and Phytophthora spp. of uncertain identity from waste irrigation water being collected in sumps for recycling to citrus orchards near Phoenix, Arizona (USA). Occurrence of the Phytophthora species was seasonal and dependent on ambient water temperatures. Species representing 47 other genera of fungi also were isolated from waste water using a dilution plate technique. Twenty-two of these genera contained species which are associated with plant diseases. Species of fungi associated with citrus diseases, however, were most frequently isolated.--Copyright 1975, Biological Abstracts, Inc.
W76-06010

LIMNOLOGICAL CHARACTER OF EXPERIMENTAL RESERVOIRS TREATED WITH TRITOX 30% (DDT, DMDT, GAMMA HCH),
National Inst. of Hygiene, Warsaw (Poland). Dept. of Communal Hygiene.
I. Cabejszek, J. Luczak, J. Maleszewska, and J. Stanislawska.
Ekol Pol. 21(8): 121-140. 1973.

Descriptors: Limnology, Bacteriology, Reservoirs, *DDT, Physicochemical properties, Pesticides, Pesticide toxicity.
Identifiers: Gamma HCH, Limnological, Methoxychlor, Reservoirs, Treated, *Tritox, *DMDT.

Hydrobiological, bacteriological and physicochemical studies were conducted on water bodies experimentally 'polluted' with Tritox 30% composed of the active substances DDT, DMDT (methoxychlor) and gamma HCH (hexachlorocyclohexane).--Copyright 1975, Biological Abstracts, Inc.
W76-06012

LIMNOLOGICAL FEATURES OF A TROPICAL IMPOUNDMENT, BHAVANISAGAR RESERVOIR (TAMIL NADU), INDIA,
Hydrobiological Research Station, Madras (India).
A. Sreenivasan.
Int Rev Gesamten Hydrobiol. 59(3): 327-342. 1974.

Descriptors: Limnology, Dissolved oxygen, Impoundments, Tropic, Production, Fish, Reservoirs, Nitrogen, Thermocline.
Identifiers: Bhavanisagar Reservoir(India).

Bhavanisagar Reservoir was studied for the period 1962-1966. Stable thermal stratification did not occur, but on rare occasions an ephemeral narrow thermocline was formed. Thermal stability (relative thermal resistance) was fairly high. Dissolved O2 was well over 50% saturation at the surface and, on some occasions, mild supersaturations were noted. Oxygen deficits occurred often as well as complete anoxic conditions on many occasions. Influx of flood waters improved the bottom O2 conditions. Anox waters from the bottom issuing from the low level outlets regained a high O2 content in a distance of 100 m. Methyl orange alkalinity and pH varied with depth, diurnally and seasonally. Hypolimnial O2 depletion was accompanied by increased bicarbonate and electrical conductivity at the bottom. All of these factors indicate a high level of metabolic activity and productivity. The pH value of the surface water never fell below 7.0 except on 1 day. The reservoir appeared to be nutrient-poor but high organic nitrogen was a characteristic of this water. It increased at the bottom. Primary production rates were fairly high, the mean of 23 estimates being 6.0 g O2/m2/day. There has been a change in fish population, some of the indigenous species having been drastically reduced in number, while some of the introduced species like Catla and Labeo calbasu have increased in the catches. The carnivore population of Macrones sp. and Wallagonia seem to have stabilized themselves. More fish probably could be exploited from the reservoir.--Copyright 1975, Biological Abstracts, Inc.
W76-06020

SOME HELMINTHS OF BULINUS TRUNCATUS AND BIOMPHALARIA ALEXANDRINA FROM THE IRRIGATION SYSTEM NEAR CAIRO,
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
For primary bibliographic entry see Field 5A.
W76-06028

GLUCURONIDE FORMATION IN RAINBOW TROUT: EFFECT OF SALICYLAMIDE ON THE ACUTE TOXICITY, CONJUGATION AND EXCRETION OF 3-TRIFLUOROMETHYL-4-NITROPHENOL,
Medical Coll. of Wisconsin, Milwaukee. Dept. of Pharmacology.
John, J. Lech.
Biochem Pharmacol. Vol 23 No 17 p 2403-24 1974 Illus

Descriptors: *Toxicity, *Larvicides, *Lampre Trout, Rainbow trout, Phenols.
Identifiers: Antidote-Drug, Excreti Fluoromethyl, Glucuronide, Salicylamide, trifluoromethyl-4-nitvophenol(TFM), TFM.

In rainbow trout, the selective sea lamprey la cide, 3-trifluoromethyl-4-nitrophenol (TFM), previously found to be conjugated with glucuro acid and excreted to a great extent in bile. In or to determine the degree and significance of con gation of TFM in trout, studies utilizing salicy mide, an inhibitor of glucuronide formation, w carried out. Pre-exposure of rainbow trout to mg/l of salicylamide decreased the LC50 of T from 5.05-2.67 mg/l. Coincidental with the crease in toxicity were elevated blood levels of conjugated TFM and a depression of TFM glu ronide in blood and bile. An increase in the leve unconjugated TFM was also found in br muscle and heart from salicylamide-treated tr Salicylamide increased the half-life of i.p. injec TFM from 1.59-4.13 h and inhibited the glu ronidation of TFM by trout liver extracts in vi Glucuronide formation appears to be an import mechanism in the protection of trout from toxic effects of TFM and possibly other wa borne phenols.--Copyright 1975, Biological stracts, Inc
W76-06031

ON SOME PROBLEMS OF THE BIOLOGIC CONTROL OF HUMAN SCHISTOSOMES EGYPT,
Ceskoslovenska Akademie Ved, Pra Parazitologicky Ustav

Rysavy, V. Barus, F. Moravec, and F. Yousif.
lia Parasitol (Prague). Vol 21 No 2 p 161-168.
74. Illus.

scriptors: *Trematodes, *Animal parcesites, termediate hosts, Human diseases.
ntifiers: Echinostomatidae, Egypt, Flukes, man, Irrigation, Schistosomatidae, Water ils.

e results of investigations of parasites of water-ils from the area of Warak El Arab, and of npetitive interactions between larval stages of matodes of the family Echinostomatidae and istosomatidae in the intermediate host are sented. The work was performed by a joint echoslovak-Egyptian team in 1971-1973. The ults confirm earlier reports on the predation of rediae of echinostome flukes upon istosome sporocysts, and the pathogenic effect the developmental stages of these flukes, in-ding the metacercariae, on the snail inter-diate host. An analysis was made of the possi-ties of utilizing this knowledge for the biologi-control of human schistosomes in areas with a se network of irrigation canals.--Copyright 5, Biological Abstracts, Inc.
6-06034

ZOOTIOLOGY OF MINCHINIA NELSONI SUSCEPTIBLE WILD OYSTERS IN VIR-NIA, 1959 TO 1971,
ginia Inst. of Marine Science, Gloucester Point.
. Andrews, and M. Frierman.
vertebr Pathol. 24(2): 127-140. 1974.

scriptors: *Virginia, *Oysters, Epizooliology, mal parasites, Fish parasites, Chesapeake Bay, nity.
ntifiers: *Minchinia-Nelsoni.

elve years after the haplosporidian parasite M. soni erupted causing severe epizootics of ters in lower Chesapeake Bay, regular patterns mortalities and disease prevalence persisted. tribution changed with salinity and weather erns, but in mesohaline areas (about 15-25 T.) pressure remained high and relatively sta-despite scarcity of oysters. Susceptible dis-e-free oysters from low-salinity areas of the es River, the major seed area in Vir-a(USA), were transplanted annually to dis-e-prevalent areas for monitoring in trays. Mor-ies were usually over 50% the 1st year and al-t as high in the 2nd year. Prevalences of the ogen, called MSX, ranged from 35-50% in live ers. Seasonal patterns of disease activity are cted from 1960-1971, and they exhibit excep-al regularity for open-water conditions. Source history of oysters, and timing of exposure are ortant variables that affect disease activity as as size and age. The disease caused by MSX ears to be not contagious in trays. The patterns isease and mortality obtained from susceptible oysters without previous exposure provided a s for evaluating other stocks including genetic ns selected for disease resistance.--Copyright , Biological Abstracts, Inc.
-06035

OTE ON THE USE OF ALGAL SIZES IN IMATES OF POPULATION STANDING PS,
oria Univ. of Manchester (England). Pollution arch Unit.
orimary bibliographic entry see Field 5A.
-06043

ROVEGETATION AND ECOLOGICAL TORS IN TWO NORWEGIAN LAKES,
Univ. (Norway). Dept. of Limnology, and Univ. (Norway). Inst. of Marine Biology.
Okland.
J Bot. 21(2): 137-159. 1974.

Descriptors: *Vegetation, *Lakes, *Ecological distribution, *Eutrophication, Organic matter, Humus, Water pollution effects, Production.
Identifiers: Elodeids, *Norway.

Sukkevtn and Grennesvatn, 2 shallow, lowland lakes in Vestfold, South Norway, are moderately eutrophic, medium rich in lime, mostly slightly acid, with maximum Secchi disc transparency values of 2.7 m and 3.5 m, respectively. Sukkevatn is considerably influenced by humic matter. Macrovegetation (specially elodeids) is more luxuriantly developed in Grennesvatn than in Sukkevatn. It is suggested that a presumably smaller biomass and lower production of water plants in Sukkevatn may be attributed primarily to a negative effect of humic matter. Horizontal and vertical distribution of macrovegetation, floristic lake typology and regional aspects of floristic lake types in Norway are discussed.--Copyright 1974, Biological Abstracts, Inc.
W76-06044

STUDIES ON THE CA, MG, AND SR CONTENT OF FRESHWATER CLAMSHELLS,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 2H.
W76-06119

GENERIC COMPOSITION AND NUTRITIONAL REQUIREMENTS OF BACTERIA ISOLATED FROM THREE LAKES,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
For primary bibliographic entry see Field 2H.
W76-06120

MICROORGANISMS AND SULPHIDE IN A POLLUTED ESTUARY,
Canterbury Univ., Christchurch (New Zealand). Dept. of Botany.
J. S. Waid.
Mauri Ora. 2, p 59-61, 1974.

Descriptors: *Estuaries, Estuarine environment, Bacteria, Microorganisms, Sulfides.

Some of the major roles of microorganisms (bacteria) in estuarine environments are described and, by considering the ways microorganisms transform S and its compounds, it is shown that microbial activities are influenced not only by what goes on in an estuary but also by events in its catchment area.--Copyright 1975, Biological Abstracts, Inc.
W76-06121

ION EXCHANGE TECHNIQUE FOR THE DETERMINATION OF CHLORINATED PHENOLS AND PHENOXY ACIDS IN ORGANIC TISSUE, SOIL, AND WATER,
National Swedish Environment Protection Board, Stockholm. Wallenberg-Lab.
For primary bibliographic entry see Field 5A.
W76-06122

MICROBIOLOGICAL AND CHEMICAL ENRICHMENT OF FRESHWATER-SURFACE MICROLAYERS RELATIVE TO THE BULK-SUBSURFACE WATER,
Virginia Univ., Charlottesville. Dept. of Biology.
R. F. Hatcher, and B. C. Parker.
Can J Microbiol. 20(7), p 1051-1057, 1974.

Descriptors: *Bacteria, *Fungi, Nitrates, Nitrites, Phosphates, Sulfates, Metals, Air-water interfaces, Ecological distribution, Eutrophication, Sampling, Chemical properties, Biological properties.

Concentrations of bacteria, fungi, ammonium, nitrate, nitrite, orthophosphate, sulfate, and certain metals were enriched in freshwater-surface microlayer samples relative to the bulk-subsurface water. Results differed markedly depending on which of 3 methods for surface microlayer collection was used. The biologically and chemically rich freshwater-surface microlayers contribute to ecological functions and interactions between subsurface water and the atmosphere not heretofore investigated in freshwater.--Copyright 1974, Biological Abstracts, Inc.
W76-06124

EMORY OAK (QUERCUS EMORYI) LITTER PHENOLICS AS ENVIRONMENTAL HAZARDS FOR AQUATIC ANIMALS IN SOUTHEASTERN ARIZONA,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5B.
W76-06125

THE INFLUENCE OF DISSOLVED OXYGEN CONCENTRATIONS ON THREE SPECIES ON WATER MITES (HYDRACARINA),
Southwest Texas State Univ., San Marcos. Dept. of Biology.
W. Young, and A. C. Rhodes.
Am Midl Nat. 92(1), p 115-129, 1974.

Descriptors: Dissolved oxygen, *Mites, Miticides, Insects, Insect control, Metabolism.
Identifiers: Hydracarina, Hydryphantes-Tenuabilis, Lactic acid, Lebertia-Quinquemaculosa, Limnesia-Undulata.

The influence of various concentrations of dissolved O2 on the metabolic rate, survival, accumulation of lactic acid and rate of movement of Hydryphantes tenuabilis from a pond and Lebertia quinquemaculosa and Limnesia undulata from a constant-temperature spring run was investigated. H. tenuabilis proved to be an O2 regulator which reached a maximum O2 consumption of 483 mm 3/g wet wt/h at about 30% O2 saturation. L. quinquemaculosa and L. undulata had maximum O2 consumptions of 568 and 732 mm 3/g wet wt/h, respectively, at the highest O2 concentration tested, 5.8 mg/l and appear to be O2 conformers. H. tenuabilis showed a more variable and higher rate of survival at dissolved O2 concentrations less than 0.1 mg/l than did either L. quinquemaculosa or L. undulata. None of the 3 spp. showed significant accumulation of lactic acid in reduced O2 concentrations. The rate of movement of L. quinquemaculosa was greatly influenced by the dissolved O2 concentration, with activity being reduced at low O2 levels; L. undulata was influenced to a lesser degree; and H. tenuabilis was virtually unaffected. The difference in responses of H. tenuabilis to various dissolved O2 concentrations as compared to L. undulata and L. quinquemaculosa may result from its evolution in ponds which experience radical changes in O2 concentrations as opposed to the more uniform conditions of streams inhabited by the other 2 spp.--Copyright 1974, Biological Abstracts, Inc.
W76-06133

YEASTS ISOLATED FROM SOME LAKES AND RIVERS OF SASKATCHEWAN,
National Research Council of Canada, Saskatoon (Saskatchewan) Prairie Regional Lab.
For primary bibliographic entry see Field 5B.
W76-06135

OUTBREAKS OF WATERBORNE DISEASE IN THE UNITED STATES, 1971-1972,
Center for Disease Control, Atlanta, Ga.
M. H. Merson, W. H. Barker, Jr., G. F. Craun, and L. J. McCabe.
J Infect Dis. 129(5) p 614-615, 1974.

Descriptors: *Viruses, *Human diseases, *United States, *Bacteria, *Chemical wastes, Water pollution effects, Public health, Water supply.
Identifiers: *Waterborne diseases.

A discussion of human disease in the USA due to contaminated water is presented. Diseases were caused by bacteria, viruses, and chemicals. Incidences from different types of water sources were compared. The discussion covers a 2 yr period. --Copyright 1974, Biological Abstracts, Inc.
W76-06138

SEASONAL DYNAMICS AND PRODUCTIVITY OF TANYTARSUS BARBITARSIS FREEMAN (DIPTERA:CHIRONOMIDAE) IN THE BENTHOS OF A SHALLOW, SALINE LAKE,
Mount Allison Univ., Sackville (New Brunswick). Dept. of Biology.
C. G. Paterson, and K. F. Walker.
Aust J Mar Freshwater Res. 25(1), p 151-165, 1974.

Descriptors: Seasonal, *Productivity, *Diptera, Benthos, *Australia, *Saline lakes, Lakes, Water pollution effects.
Identifiers: Necterosoma-Penicillatum, Tanytarsus-Barbitarsis, *Victoria(Lake Werowarp), Shallow lakes.

The chironomid T. barbitarsis is the only abundant benthic species in Lake Werowrap, western Victoria (Australia), a small, shallow, highly alkaline lake in which high, fluctuating salinities (36-56 g/l) impose an extremely low biotic diversity. Between successive Octobers in 1969 and 1970, the chironomids passed through about 7 generations, attaining numerical densities in excess of 140,000/m2. Seasonal fluctuations in density were attributed to emergence, available food, and predation by a dytiscid, Necterosoma penicillatum, occurring in high densities around the rocky marginal areas of the lake. Estimated annual net production, exclusive of mortality and 1st and 2nd instar biomass, amounted to about 320 kcal/m2/yr. This is perhaps the highest estimate recorded for an inland aquatic macrobenthos community. Evidence from salinity tolerance experiments suggests that the lake is not an optimal environment for the species.--Copyright 1974, Biological Abstracts, Inc.
W76-06142

DYNAMICS OF BENTHIC INVERTEBRATES IN A TROPICAL MAN MADE LAKE (VOLTA LAKE 1964-1968): STANDING CROP AND BATHYMETRIC DISTRIBUTION,
Monash Univ., Clayton (Australia). Dept. of Zoology.
T. Petr.
Arch Hydrobiol. 73(2), p 245-265, 1974.

Descriptors: Standing crops, Laks, Invertebrates, Benthic fauna, Diptera, Mayflies, Distribution patterns, Biomass, Dissolved oxygen, Africa.
Identifiers: Nilodorum-Brevibucca, Povilla-Adusta, *Volta Lake(Ghana), Man-made Lakes.

During the 1st 5 yr of the filling of Volta Lake (in Ghana, West Africa) 2 major groups of invertebrates dominated the benthic fauna: ephemeropterans, especially the nymphs of Povilla adusta Navas, and chironomids, especially the larvae of Nilodorum brevibucca Freeman and Chironomus spp. Their later decline in numbers resulted in a decrease in the biomass of the benthic invertebrates in the lake. The quantitative and qualitative changes in the benthic fauna in this lake seem to be determined to a large extent by changes in the substratum due to shoreline erosion. The lowering of the O2 discontinuity and the prolongation of periods of high dissolved O2 content in deep water helped the bottom fauna to occupy greater depths, but did not prevent the decrease in the total standing crop of benthic invertebrates in the lacustrine sector during the process of lake ageing. The major inflows are responsible for maintaining a high biomass of the bottom fauna in areas under their direct influence.--Copyright 1974, Biological Abstracts, Inc.
W76-06144

SEASONAL DISTRIBUTION OF PHYTOPLANKTON IN KINJHAR (KALRI) LAKE,
Univ. Karachi, Karachi, Pak. Dep. Zool., Karachi Univ. (Pakistan). Dept. of Zoology.
S. Nazneen.
Pak J Bot. 6(1) p 69-82, 1974.

Descriptors: Phytoplankton, Seasonal, Ecological distribution, Asia, Lakes, Eutrophication, Chlorophyta, Cyanophyta, Algae.
Identifiers: Bacillariophyceae, Melosira-Granulata, Microcystis-Aeruginosa, *Pakistan(Kinjhar Lake), Spirogyra-Fuellebornei.

An ecological survey of phytoplankton in Kinjhar Lake (Pakistan) was carried out from March 1968 to Feb. 1971 at the surface and from March 1970 to Feb. 1971 at various depths. Phytoplankton belonging to Cyanophyceae (22 spp. belonging to 12 genera), Bacillariophyceae (53 spp. belonging to 27 genera) and Chlorphyceae (19 spp. belonging to 8 genera) were observed. Microcystis aeruginosa was the most abundant species present throughout the year at the surface, but its maximum growth was observed in summer. Melosira granulata and Spirogyra fuellebornei were next in abundance. Kinjhar Lake is highly eutrophic.--Copyright 1974, Biological Abstracts, Inc.
W76-06146

THE COMBINED EFFECTS OF HIGH SALINITY AND TEMPERATURE ON THE SURVIVAL OF YOUNG LIMANDA LIMANDA,
Leeds Univ. (England). Wellcome Marine Lab.
D. Lowthion.
Mar Biol (Berl). 25(3), p 169-175, 1974.

Descriptors: Salinity, Temperature, Mortality, Fisheries, Water pollution effects, Model studies, Water pollution sources, Waste disposal.
Identifiers: Limanda-Limanda, Dabs.

Young specimens of the most common inshore flatfish, the dab L. limanda, in the area of a proposed concentrated brine discharge, off the Yorkshire coast (England) were subjected to high salinities over temperatures corresponding to an annual temperature range. The results of these experiments have been used in the design of a dilution and dispersion system to protect the inshore fisheries. Mortality is size-dependent, smaller dabs being least resistant. Response-surface analyses were utilized, showing mortality in relation to immersion time. The effect of temperature slowly declines with increased immersion time and salinity becomes increasingly dominant. A significant salinity-temperature interaction was observed, which reached its peak effect at 3 h immersion. A 3-dimensional response-surface model of the mortality contours, for salinity, temperature and immersion time, was produced which may be used to set upper limits to the design of the effluent disposal system. If salinity does not rise above 55 re parts per thousand, it is unlikely that significant changes in the L. limanda populations will occur.--Copyright 1974, Biological Abstracts, Inc.
W76-06148

5D. Waste Treatment Processes

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alex., Va.
G. K. Young.
Water Resources Research, Vol. 12, No. 1, p 94-100, February 1976. 2 fig, 2 tab, 10 ref.

Descriptors: *Urban hydrology, *Storm water, *Water pollution control, *Methodology, *Sewers, Overflow, Decision making, Screening, Alternative planning, Treatment facilities, Equations, Systems analysis.
Identifiers: Sensitivity analysis.

A novel and simple method of analysis of th urban combined sewer and overflow problem developed. An aggregated method is presente which relates a few significant variables produce a scalar that describes the severity of po lution for an urban area. Typical values of the va ables are assigned, and sensitivity analysis urban storm-induced pollution to various contr measures is demonstrated. The method takes macroanalytic perspective which should produ comparisons adaptable to decision rules for fun ing priorities. Work on specific cities is necessa to refine the approach and rank alternatives. T method should screen out poor candidates f funds early in the decision-making process a concentrate feasibility studies and analysis up needy sites and viable alternatives. It is conclud that: (1) the method has utility for first-lev screening of alternatives at the national or sta decision-making level; (2) the hydrologic variabl do not enter into the assessment of the maximu pollutional impacts of storms; (3) a relatively sm set of variables, several relating to water use a the sewer treatment system and the other defini the quality of receiving waters, storm wash a raw sewage are used to conduct the analysis e ploying the simplified method; and (4) the ma imum storm-induced water quality is several tim the water quality associated with the dry weath engineering design limits of sewage treatment p formance. (Bell-Cornell)
W76-05509

METHOD OF BIOLOGICAL PURIFICATIO OF SEWAGE,
Degremont Societe Generale d'Epuration d'Assainissement, Rueil-Malmaison (Franc (Assignee).
J. L. Bebin.
U. S. Patent No. 3, 928,190, 5 p, 4 fig, 9 ref; Of cial Gazette of the United States Patent Offic Vol 941, No 4, p 1781, December 23, 1975.

Descriptors: *Patents, *Waste water treatme *Sewage treatment, Water purification, Water p lution control, Water quality control, Floccu tion, Filtration, Aeration, Aerobic conditio *Biological treatment.
Identifiers: Biologic filters.

Methods of purifying sewage containing a str organic pollution comprises two successive stag The first, a flocculation stage is performed using non-toxic and non-bacteriostatic reage selected from the group consisting of alumini salts and iron salts. The immersed biological filt tion stage is performed on a filter bed formed o porous mass of granular material having smo zones on the surfaces capable of supporting b terial film and limited hollow zones capable of s porting bacterial film and retaining such film ev when the filter is subjected to severe backwashi The granular material is formed by burning c with dextrin approximately 900 dec C. backwashing of the filter removes bacterial f from the smooth zones while bacterial film rem in limited zones and the wash water is recyc into the waste water at a position upstream of flocculation stage thus producing a perman reseeding of the sewage and maintaining biological equilibrium of the filtering mass. (Si - OEIS)
W76-05524

BIODEGRADATION OF METHANOL WASTE WATER,
Du Pont de Nemours (E. I.) and Co., Wilmingt Del. (Assignee).
I. J. Belasco.
U. S. Patent No. 3,928,191, 4 p, 7 tab, 7 ref; O cial Gazette of the United States Patent Office 941, No 4, p 1781, December 23, 1975.

Descriptors: *Patents, *Waste water treatme *Sewage treatment, Water pollution treatme Water quality control, Water pollution cont

iodegradation, Methane bacteria, Aerated goons, Montmorillonite.
entifiers: *Methanolic waste water.

e rate of microbial biodegradation of methanol-waste water can be accelerated by carrying out biodegradation in the presence of dispersed, rticulate attapulgite or montmorillonite clay. crobes suitable for this type of biodegradation abundant in river water, soil, activated sludge, raw sewage. By methanolic waste water is ant water having an organic content of 0.01 to % (preferably 0.05 to 5%) by weight, at least % of which is methanol. The waste water can ntain as much as 2% by weight KCl and other rganic salts. The process is carried out at a pH the range of about 6 to 8 (preferably 6.5 to 7.5) temperature in the range of about 5 deg to 38 C. (preferably 30 deg to 35 deg C.) The average rticle size of the clay is in the range of about 0.5 40 microns and the clay concentration is in the ge of about 10 to 10,000 ppm. The process can carried out in a biological reactor or aerated oon. The clay is maintained in suspension by propriate agitation from stirring devices or aera-s. The pH can be maintained by addition of al-kaline's such as ammonia, calcium oxide, stic, or lime, or by use of a buffer. (Sinha - IS)
6-05525

FFERED, WEAK ION-EXCHANGE WATER MINERALIZATION PROCESS,
rojet-General Corp., El Monte, Calif. signee).
primary bibliographic entry see Field 3A.
6-05526

QUID PURIFYING PROCESS,
lmik, Inc., East Lansing, Mich. (Assignee).
. Hoeltgen, and H. E. B. Humphrey.
. Patent No. 3,928,195, 8 p, 8 tab, 6 ref; Offi- Gazette of the United States Patent Office, 941, No 4, p 1782, December 23, 1975.

scriptors: *Patents, *Waste water treatment, ter quality control, Water pollution treatment, pended solids, *Sludge, Chemical reactions, ltration, Farm wastes, Domestic wastes, avy metals.
ntifiers: *Metal recovery.

process comprises sequentially introducing a uble alkali aluminate such as sodium aluminate, luble alkali silicate such as sodium silicate, and luble ammonium ion source or a soluble di- or alent cation source, preferably a soluble di- or alent metal salt such as calcium chloride, with ation into the liquid system to be treated. The lting complex of the recovered solids is then arated from the liquid by filtration. The es-ce of the process is a sequential reaction ween the three chemicals in the environment of system being treated which produces a com- which entraps or complexes with the pended solids and even some solutes and which adily separated by filtration. The process is able for purifying a variety of liquid systems, uding aqueous and certain organic liquid ems. The process is believed to be effective purifying any kind of waste waters with very to very high waste concentrations and very settleable solids concentrations, e.g. between d about 900,000+ ppm settleable solids. The ess yields a highly dewatered complex of vered solids which can be safely stored, han-, and beneficially used. (Sinha-OEIS)
-05528

IBITION OF SCALE DEPOSITION,
on Corp., Pittsburgh, Pa. (Assignee).
Persinski, P. H. Ralston, and R. C. Gordon,

Patent No. 3,928,196, 3 p, 2 tab, 1 ref; Offi- Gazette of the United States Patent Office, 941, No 4, p 1782, December 23, 1975.

Descriptors: *Patents, *Waste water treatment, *Scaling, *Inhibition, *Inhibitors, *Hardness(Water), Demineralization, Industrial water, Damages, Chemical precipitation, Chemical reactions.
Identifiers: Industrial water systems.

Most industrial waters contain alkaline earth metal cations and several anions. When combinations of these anions and cations are present in concentrations which exceed the solubility of their reaction products, precipitates form. Solubility product concentrations are exceeded for various reasons, such as partial evaporation of the water phase, change in pH, pressure or temperature, and the introduction of additional ions which form insoluble compounds with the ions already present in the solution. As these reaction products precipitate on surfaces of the water carrying system, they form scale or deposits. This accumulation prevents effective heat transfer, interferes with fluid flow, facilitates corrosive processes, and harbors bacteria. Copolymers of 2-acrylamido-2-methylpropyl sulfonic acid and acrylic acid are effective in inhibiting scale formation and deposition in aqueous systems. These copolymers may have a molecular weight of from about 1000 to 100,000 and may contain from about 5% to 75mole% 2-acrylamido-2-methylpropyl sulfonic acid and from about 95 to 25 mole% acrylic acid. Experiments at several temperatures for various lengths of time demonstrate the effectiveness of different concentrations and forms of these combinations in inhibiting the precipitation of scale-forming salts. (Sinha-OEIS)
W76-05529

BIO POND AERATOR,
K. F. Cherry.
U.S. Patent No. 3,928,512, 3 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1865, December 23, 1975.

Descriptors: *Patents, *Waste water treatment, *Water treatment, Water pollution treatment, Water quality control, *Aeration, Mixing, Aerated lagoons, Water circulation, Application equipment.

A device is described which is used in aerating and mixing the liquid in conventional water and waste water treatment facilities. A tube extending above the liquid surface and below the surface to a predetermined depth contains an impellor on a shaft connected to a motor. A float ring, attached around the tube, is sufficiently buoyant to float the entire device and the effective weight of liquid in the tube while operating. Aerator arms are provided with a float on one end and a hinge attachment to the tube. Overflow weirs allow liquid raised by the impellor to flow onto the aerator arms. The arms provide spillage of liquid by means of holes in their lower surfaces. Two or more paddle-like structures are mounted on the tube below the liquid surface. When the impellor is turned the liquid rises in the tube causing it to spin and mix the liquid by means of the paddles. The same torque causes the arms to move in a circular path over the surface. As the liquid raised by the impellor flows over the weirs onto the aerator arms, it is pulled by gravity toward the float end of the arms. Holes in the arms lower surface allows liquid to fall and impact upon the liquid surface resulting in aeration. (Sinha-OEIS)
W76-05535

LEACHING POLYELECTROLYTE FLUIDIZED SOLIDS,
American Cyanamid Co., Stamford, Conn. (Assignee).
R. B. Booth.
U. S. Patent No. 3,928,551, 12 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1876, December 23, 1975.

Descriptors: *Patents, *Waste water treatment, Suspended solids, Solid wastes, Flow control, Aqueous solutions, Industrial water, Polymers, *Polyelectrolytes, *Leaching.
Identifiers: Resuspension.

The fluidizing of finely-divided solids particularly those containing a broad range of particle sizes, during acid leaching and related operations by the use of a water-soluble polyelectrolyte is described. The process is applicable in maintaining the fluidity of suspensions of sand, silt or dredged materials, and maintaining solids in resuspendable forms. The presence of a polymer of the acrylamide-acrylic acid-acrylonitrile type causes the fines to remain with the large particles and settle out comparatively homogeneously. This aids in preventing deposits of coarse materials in settling tanks, leach tanks, internal combustion engines and their radiators, heat exchangers, cooling towers, flowing streams in natural or man-made water courses, and mine operations, and the polymer in solution can penetrate into coarse material with fines so that settled material can be resuspended. Sometimes preexisting deposits are loosened and resuspended along with the solids maintained in fluidized state. Such deposits are particularly predominant in sewage lines including sanitary, storm and industrial lines and in circulating water lines. The polyelectrolyte may be added at any point in the processing. Additional quantities of the same or different polyelectolyte may be added to assist in a subsequent dewatering operation. Suitable polymers are polyacrylic and polyacrylamide, hydrolized polyacrylonitrile, and alkali-hydrolyzed, polyacrylamide, and acrylic acid-acrylamide copolymers. (Sinha - OEIS)
W76-05536

PROCESS FOR BIOCHEMICAL REACTIONS,
Gary Aircraft Corp. San Antonio, Tex. (Assignee).
P. E. Smith.
U. S. Patent No. 3,929,630, 6 p, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2232, December 30, 1975

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Sewage treatment, Water pollution treatment, Aerobic conditions, Anaerobic conditions, Biodegradation, Filtration, Oxydation, Biochemical Oxygen Demand, Trickling Filters.
Identifiers: *Biochemical reactions.

A biochemical reaction is carried out by introducing the reactants to the surface of a rigid, porous and adsorbent silican foam substrate which has been coated with an organic polymer prior to the introduction of the reactants. Biochemical reactions include the treatment of sewage, treatment of liquid effluent such as waste water, and fermentation of carbohydrate liquids. The reactions may be aerobic, anaerobic or facultative. The trickle filter may be of conventional design structurally except that the filter media or substrate is prepared from an inorganic foamed material. The vessel or enclosure is provided with means for introducing the liquid such as a pipe and spray head so that the liquid is passed through the filter media. Oxygen is introduced by any suitable means. The inorganic foam providing higher surface areas allows for a longer holding time for nutrients on the surface and allows for greater throughput. The silica foam substrate also exhibits greater capillary action characteristics with the consequent advantage that the substrates do not dry as rapidly during periods of non-use. (Sinha - OEIS)
W76-05542

METHOD AND APPARATUS FOR CENTRIFUGALLY SEPARATING FINELY DIVIDED SOLIDS FROM AQUEOUS SUSPENSIONS THEREOF,
Canadian Patents and Development Ltd., Ottawa (Ontario). (Assignee).
J. Visman, and H. A. Hamza.
U.S. Patent No. 3,929,633, 7 p, 4 fig, 7 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2232, December 30, 1975.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Water pollution control, Effluents, Water quality, *Suspended solids, *Separation techniques, Flocculation, *Centrifugation, Application equipment.

A method and apparatus is provided for centrifugally separating finely divided solids from aqueous suspensions by forming dense, strong flocs which are larger than the 'size cutpount' of a cyclone separator so that the flocs can be separated. A flowing sheet of the aqueous suspension is formed into a swirling cone in a blender. A solution of a water soluble high molecular weight, long chain flocculant is sprayed at right angles into the side face of the flowing sheet so that the flocculant is absorbed into the wetted surfaces of the finely divided solids. Floc strength is achieved by rapidly dispersing the flocculant in suspension in such a way as to promote maximum bridging rather than excessive adsorption. Floc size is determined by flocculant dosage. Dosage in two or more stages increases floc density and floc strength. The flocs are then centrifugaly selparated by a cyclone separator. (Sinha - OEIS)
W76-05543

USE OF POLYMERIC QUATERNARY AMMONIUM BETAINES AS WATER CLARIFIERS,
Petrolite Corp., St. Louis, Mo. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05544

PROCESS FOR CONDITIONING EFFLUENT CONTAMINATED BY ALDEHYDE COMPOUNDS,
Air Liguidel Societe Anonyme pour l'Etude et l'Exploitation des Procedes, Paris (France). (Assignee).
J. P. Zumbrunn.
U. S. Patent No. 3,929,636, 4 p, 1 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2233, December 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Effluents, Water pollution control, Water pollution treatment, Water quality control, Oxidation, Chemical reaction, Toxins, Chemicals.
Identifiers: Aldehydes, Formaldehyde, Caro's acid.

The invention describes an industrially applicable process which provides rapid, complete and economic detoxification of effluent contaminated by aldehyde impurities. The process comprises oxidizing the impurities with a peroxy compound containing the anion SO5--, the preferred peroxy being either Caro's acid, H2S05, as an aqueous solution of the free acid, or a salt of Caro's acid. The treatment can take place at ambient temperature and the oxidant can be mixed with the effluent at a neutral or moderately alkaline pH which is preferably at least 9 and most preferably is between about 9 and about 10. The treatment time depends on the pH, the reaction time being determined mainly by the pH since breakdown of the formaldehyde proceeds more rapidly as the pH is more alkaline. The oxidant can be introuced all at once or in two or more stages. (Sinha-OEIS)
W76-05545

FILTERING APPARATUS AND PROCESS,
Gaston County Dyeing Machine Co. Mount Holly, N. C. (Assignee).
J. K. Turner, and G. L. Parsons.
U.S. Patent No. 3,929,639, 4 p, 5 fig, 19 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2234, December 30, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, *Filtration, Water conservation, Water reuse, Textiles, Fibers(Plant), *Recycling.
Identifiers: Lint, Filter regeneration.

The lint content of wash water effluent, particularly from textile wet processing operations, has previously hampered attempts at recycling because of the difficulty inherent in removing the lint effectively enough in a practical way to condition the water satisfactorily for reuse. A filter system is disclosed in which circulation of the liquid to be filtered is such that a predominant portion is continually returned through the filter unit to produce a filtered permeate amounting to 70% or more of the feed while also tending to clear the filter media continually. Depending on the particular condition of the liquid being handled, the filter system can be used effectively in single unit form with periodic regeneration being employed, as necessary, to maintain the filtering function, or a multiple unit arrangement is provided in which one unit of the multiple, in sequence, is always regenerating while the others are operating and a continuous output is maintained in this way. Regeneration of the filter units is effected by closing them against filtered permeate output so that the filter media is subjected to the cleansing action of liquid circulation only at its active face. The filter media is provided in elongate cartridge form and placed within a cylindrical housing to leave an annular circulation space to which the liquid to be filtered is delivered tangentially at points spaced lengthwise of the elongate cartridge. (Sinha - OEIS)
W76-05546

WATER TREATING APPARATUS,
Ecodyne Corp., Chicago, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05547

PROCESS FOR TREATING WASTE WATER CONTAINING CELLULOSE NITRATE PARTICLES,
Office of the Secretary of the Army, Washington, D. C. (Assignee).
T. M. Wendt, and A. M. Kaplan.
United States Patent 3,939,068. Issued February 17, 1976. Official Gazette of the United States Patent Office, Vol. 943, No. 3, p 1343, February, 1976.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Patents, Biodegradation, Chemical degradation, Chemical reactions.
Identifiers: *Nitrocellulose nitrate wastes.

A process for the treatment of a waste stream from nitrocellulose manufacture containing at least 50 ppm of insoluble, non-biodegradable nitrocellulose material has been patented. The insoluble material is chemically digested by reacting it with alkali at a pH of at least 11.5. This converts the insoluble material to soluble and biodegradable organic and nitrate products. After chemical digestion, the waste stream is neutralized to a pH between 6.0 and 9.0. The neutralized waste stream is combined with domestic raw sewage and a microbially utilizable carbon material to form a mixed liquor. The mixed liquor is microbially denitrified, converting the nitrate content to nitrogen gas. The solids are separated from the liquor which is then subjected to aerobic biological treatment, degrading the organic products and converting reduced nitrogen compounds to nitrates. The effluent from the aerobic treatment is then denitrified. The process will produce a substantially nitrate-free effluent with an acceptable BOD level. (Orr-FIRL)
W76-05575

QUALITY AND VARIATION OF POLLUTANT LOADS IN URBAN STORMWATER RUNOFF,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05576

WATER CLARIFICATION SETTLER.
For primary bibliographic entry see Field 5F.
W76-05578

WASTEWATER TREATMENT,
Autotrol Corp., Milwaukee, Wis. (Assignee).
W. N. Torpey.
United States Patent 3,915,854. Issued October 1975. Official Gazette of the United States Pate Office, Vol. 939, No. 4, p 2090, October, 1975 fig.

Descriptors: *Waste water treatment, *Paten *Biological treatment, *Oxidation, Equipme Suspended solids, Ammonia, Nitrogen, Biochei cal oxygen demand.

A patented method for treating waste water c taining carbonaceous pollutants, expressed terms of BOD and ammonia nitrogen in a wei ratio of at least 3.6:1 is described. Steps incl removing settleable and flotable solids from waste water; supplying the waste water to a ho ing tank and storing it there; passing the wa water at a predetermined rate from the hold tank to a biological treatment unit; and direct the biologically treated waste water to a final cl fier. In the clarifier, where suspended solids removed, biological treatment includes not m than a single rotatable shaft supporting seve partially submerged biological contactors. Th have a surface area for the growth and ma tenance of organisms, and create a flow of wa water through the biological treatment unit i direction generally perpendicular to the rotata shaft. The shaft is rotated to impart a predet mined peripheral velocity to the biological cont tors, alternately exposing the surface area to wa water and an oxygen-containing atmosphere. rate and peripheral velocity are chosen to sim taneously oxidize at least 83 weight percent of BOD and at least 46 weight percent of the monia nitrogen. (Kramer-FIRL)
W76-05579

WASTE WATER AND SEWAGE TREATMEN
French Patent FR 2256-902. Issued Septembe 1975. Derwent French Patents Abstracts, Vol. No. 43, p D3, December 2, 1975.

Descriptors: *Waste water treatment, *Sew treatment, *Biological treatment, *Activa sludge, *Dissolved oxygen, *Patents, Aerati Sludge treatment, Oxygen, Biodegradation.

A method of waste water and sewage treatm using dissolved oxygen and activated sludge been patented. Wastes containing biodegrad impurities are treated in one or more enclosu The contacts between the waste water, the tivated sludge, and the dissolved oxygen are in sified by increasing the number of interfaces by shortening the diffusion paths in the slu floccules. This is accomplished by injectors, u with a liquid nozzle, an annular, concentric no for the gas, and an impulse exchange tube. A li jet leaves the nozzle at a speed of 29 m/sec sets up a shear gradient in the activated slu The air bubbles are finely divided and the sludg simultaneously sucked into the zone of the jet intensely mixed in the tube. Sludge leaving tube is saturated with oxygen; gases within sludge cause it to rise in the form of a bubb column to the surface of the activated sludge. quantity of sludge which can be treated per un volume per day is twice that of a conventi biological treatment facility. (Kramer-FIRL)
W76-05580

SUBMERGED AIR RELEASE DEVICE P TICULARLY FOR SEWAGE TREATMENT,
Envirex, Inc., Waukesha, Wis. (Assignee).
J. I. Moloney.
United States Patent 3,915,862. Issued Octobe 1975. Official Gazette of the United States Pa Office, Vol 939, No 4, p 2093, October, 1975. I

Descriptors: *Waste water treatment, *Sewage treatment, Aeration, *Patents, Equipment, Biological treatment, Slime.
Identifiers: Air diffusers, Air release device.

A patent has been issued for a submerged horizontal air supply header which operates in combination with a sewage aeration tank. This release device discharges air from spaced orifices arranged within the tank in a line such that rising air bubbles induce a general rolling motion of the sewage. The sewage liquid is swept across the floor of the tank toward the header, where several air diffuser devices are attached. Each diffuser comprises a box-like structure including a top, side, and end walls forming a chamber which opens downwardly and has a number of orifices near its top. In normal operation, the lower part of the chamber is partially filled with sewage up to the hydrostatic pressure level of the air supply but below the orifices. The entire lower end of the diffuser is open and of substantial horizontal length. The sweep of the sewage toward the header, therefore, extends to the air-sewage interface in the diffuser chamber and prevents the accumulation of biological slime. (Kramer-FIRL)
W76-05581

SEWAGE TREATMENT,
J. Luck.
United States Patent 3,915,853. Issued October 28, 1975. Official Gazette of the United States Patent Office, Vol 939, No 4, p 2090, October, 1975.

Descriptors: *Patents, *Sewage treatment, Organic compounds, *Inorganic compounds, Bacteria, Metals, Biological treatment, Chemical precipitation, Acidity, Alkalinity, *Waste water treatment.

A method has been patented for the treatment of liquid sewage containing both organic and inorganic compounds. These may include: a precipitate metal or metals; a compound containing any combination of starches, proteins, glycerides, and sugars; and pathogenic or other bacteria. The process involves adding to the sewage one or more alkaline compounds elected from the group of alkali metal carbonate, alkali metal bicarbonate, and alkali metal hydroxide to precipiate out the metals as insoluble carbonates, bicarbonates, hydroxides, and oxides. These precipitated materials are removed from the rest of the liquid, adding enough alkaline material to the sewage to raise the pH to over 11, thus destroying pathogenic and other bacteria in the sewage. Enzymes are released from the bacteria into the solution, lowering the pH of the sewage to between 3.5 and 6.5 by the addition of an acidic material. Any materials from the group consisting of starches, proteins, glycerides, and sugars are therefore enzymatically digested by the enzymes released. Seed bacterial, fungal or yeast organisms are then added to the sewage and assist in decomposing organic components. The sewage is acidified after substantial decomposition to kill the organisms developed from those seeded; dead organisms and other insoluble materials present are removed and the remaining liquid is neutralized. (Kramer-FIRL)
W76-05582

CARBON WASTEWATER TREATMENT PROCESS.
Public Works, Vol 107, No 2, p 62-63, February, 1976. 1 fig.

Descriptors: *Sewage sludge, *Recycling, *Waste water treatment, *Sewage treatment, *Activated carbon, Dewatering, Separation techniques, Water quality control, Pilot plants.
Identifiers: Pyrolysis.

A method has been developed for the recycle of sewage sludge, in which the solids are upgraded in value by processing to an activated carbon, which is then used to purify the water from which they were removed. In a pilot plant test, sludge solids were effectively extracted and dewatered without the aid of coagulants. The solids were converted to an activated carbon in a pyrolysis reactor and showed removal characteristics equal to or better than commerical carbons. The newlyproduced carbon could then be used to promote separation of settleable and suspended solids from the sewage and to remove dissolved solids from the water. The potential of this system to meet or exceed both federal and state requiremets for water disposal quality was also demonstrated. (Kramer-FIRL).
W76-05583

CATHODIC INNER AND OUTER PROTECTION FOR A DOUBLE SYPHON FOR WASTE WATER (KATHODISCHER INNEN-UND AUSSENSCHUTZ FUER EINEN ABWASSER-DOPPELDUEKER),
F. Paulekat, and H. Schapp.
Die Bautechnik, Vol. 52, No. 9, p 305-311, September, 1975. 16 fig, 6 ref.

Descriptors: *Siphons, *Municipal wastes, *Waste water treatment, Pipes, Plastics, Cathodic protection, Anodes, Installation, Insulation.
Identifiers: Germany.

A new double waste water siphon installed underneath the Rhine-Herne Channel in West German, and its cathodic inner and outer protection are described. The municipal waste water siphon, replacing the old one destroyed by corrosion, has inner cathodic protection by means of foreign current, using a continuous anode near the pipe wall and attached to the latter with opposite electrodes on the pipe wall. Outer protection is accomplished by means of two Fe/Si anodes at a 70 m distance. The inner anode is protected by a plastic tube. The experience gained with the construction of the cathodically protected siphon shows that insulation should follow installation. (Takacs-FIRL)
W76-05584

CHEMICAL PRECIPITATION OF WASTEWATERS WITH LIME (KEMISK FALLNING AV AVLOPPSVATTEN MED KALK),
S. Gronkvist, B. Hultman, S. Kapilashrami, and P. Nielsen.
Kemisk Tidskrift, Vol. 87, No. 7/8, p 46-48, August, 1975. 3 fig, 1 tab, 19 ref.

Descriptors: *Waste water treatment, *Chemical precipitation, *Lime, Sludge treatment, Activated sludge, Filtration.
Identifiers: Pho-Strip Process.

Different methods for the precipitation of waste water components with lime are discussed with respect to improved efficiency and reduced lime expenditure. The recirculation of purified water, the precipitation of calcium phosphate compounds on a solid carrier material, such as apatite or sand, and the addition of calcium and fluoride ions are among the basic possibilities to reduce the lime expenditure for precipitation. Very low lime doses of 20 to 24 mg calcium per liter can be used for Biospherics' 'Pho-Strip Process', in which precipitation takes place in the return sludge stream. Substantial reduction of the lime dosage may be achieved by a combination of this method and the passage of the entire purified water from the activated sludge process through a filter or apatite bed. (Takacs-FIRL)
W76-05585

NEW SYSTEM PUTS THE WOOD TO WASTEWATER,
Kirkham Michael and Associates, Omaha, Nebr.
C. L. Weber, and C. D. Jacobson.
Water and Wastes Engineering, Vol. 12 No. 12, p 51-52, 64, December, 1975. 1 fig.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, Food processing industry, Municipal wastes, Nebraska, Costs, Biochemical oxygen demand, Suspended solids, Filters, Filtration.
Identifiers: *Municipal-industrial waste treatment, Joint treatment.

Redwood media roughing filters and a completely mixed activated sludge system are part of the new secondary waste water treatment plant servicing two meat processing industries and the municipal population in Fremont, Nebraska. The joint treatment plant utilizes all the existing facilities of a treatment plant built in 1965. Designed for an average hydraulic load of 10.5 mgd per day, the facilities can treat an organic load of 37,000 pounds per day of BOD and 25,500 pounds per day of suspended solids. In addition, the plant was designed to handle a load of 14,100 pounds of grease per day. A dissolved air flotation system was installed for grease removal prior to primary clarification. To handle the high strength organic waste, the redwood roughing trickling filters were designed to precede the completely mixed activated sludge system. The roughing filters are designed to achieved 50% BOD reduction without recirculation. Other major treatment processes at the plant include pre- and post-chlorination facilities for odor control and disinfection. The construction costs of the secondary treatment plant improvements and modifications were $2.6 million, 80% of which were financed by state and federal grants. After three months of full scale operation, the results are the following: the monthly average flow to the plant is 4.0 mgd with an average strength of 675 mg/liter of BOD; suspended solids in the raw flow are averaging 475 mg/liter while the grease concentration is 260 mg/liter; final effluent discharged from the plant is currently averaging 15 mg/liter of BOD and suspended solids; and grease concentration in the final effluent has averaged less than 10 mg/liter. (Loustau-Firl)
W76-05586

ALIGNMENT OF LONGITUDINALLY AERATING AERATION TANKS (NALADKA AEROTANKOV PRODLENNOY AERATSII),
G. G. Ryazanskiy, and A. D. Lerner.
Vodosnabzhenie i Sanitarnaya Tekhnika, No. 6, p 32, 1975. 2 fig.

Descriptors: *Aeration, *Tanks, *Waste water treatment, *Construction materials, Equipment, Climates.
Identifiers: Soviet Union.

Criticism has been given of longitudinally aerating aeration tanks manufactured currently in the Soviet Union. The inlet grid mesh should be reduced from 10 x 10 mm to at least 5 x 5 mm to prevent large floating pieces from entering the aeration, and hence the return sludge. Also, the aeration intensity should be highest in the inlet section rather than at the outlet section. Aeration tank designs should not be chosen without regard to the climatic conditions under which they are to be operated. In particular, exposed metallic tanks are unsuitable for subarctic and arctic regions. (Takacs-FIRL)
W76-05587

CONVERSION OF A TRICKLING FILTER PLANT TO ACTIVATED SLUDGE,
Clapsaddle-Garber, Marshalltown, Iowa.
D. M. Fox.
Public Works, Vol. 107, No. 1, p 48-49, January, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Activated sludge, Construction costs, Water quality standards, Repairing, Aeration.
Identifiers: Facilities renovation, Trickling filter plants.

A deteriorating waste water treatment plant that had been built in 1937 was redesigned and renovated in order to meet EPA effluent quality standards. The existing structure was a typical plant having primary settling, trickling filter, final settling, a heated anaerobic digester, and sludge drying beds. The plant was subject to flooding from the Iowa River 200 feet away. In order to meet the new standards it was necessary for the plant to produce an effluent BOD of 30 mg/liter, suspended solids of 30 mg/liter, and bacteria colony count of 200 per 100 ml. To renovate the plant, the trickling filter distributor and rock were removed from the 89-foot diameter filter structure and the structure was rebuilt to accommodate the installation of concentric aeration and final settling chambers, the outer annular chamber serving for aeration. The traveling bridge which spans the structure supports two Passavant horizontal axis rotor surface aerators which operate in the outer ring of the baasin. The old final clarifier was remodeled to serve as a detention tank for chlorination and the digester was modified to function as an open sludge storage tank and sludge thickener. The waste sludge is thickened and pumped to a tank wagon drawoff or to the sludge drying beds which were rehabilitated. Use of existing structures to the maximum possible extent contributed to the low cost of $302,000 for construction, materials, and site dewatering. The plant produces an effluent suitable for discharge to a river utilized for potable water supply downstream. (Loustau-FIRL)
W76-05588

REMOVAL OF AMMONIA NITROGEN BY CATALYTIC OXIDATION FILTER BED (SESSHOKU SANKA ROSHO NI YORU AMMONIA-SET CHISSO NO JOKYO),
S. Iwai, K. Kitao, and S. Tejima.
Preprint, Japan Society of Civil Engineers, Tok[illegible], p 526-527, 1975. 6 fig, 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Activated sludge, *Simulation analysis, Oxidation, Biological treatment, Ammonia, *Nitrogen, Dissolved oxygen, Organic compounds, Nitrification.
Identifiers: Starches, *Ammonia nitrogen.

The removal of ammonia nitrogen by activated sludge was studied using a simulation of sewage water containing 50 mg/liter CaCl2, 61 mg/liter MgSO4, 113 mg/liter KH2PO4, 252 mg/liter K2CO3, and various NH4C1 concentrations. Activated sludge was placed in a filtration bath. Experiments were performed using both flowing and non-flowing sewage systems, and the ammonium concentrations were measured. The reduction of ammonia nitrogen [illegible] curs in two ways: diffusional migration of [illegible]monia nitrogen into the floc, and biological oxidation. The effect of the oxidation rate was examined for the solution pH, dissolved oxygen (DO), organic compounds concentration, and ammonium concentration. The suitable solution pH to give the peak oxidation rate was 7 to 8. The effect of DO concentration was clearly observed even at high DO concentrations, and the oxidation rate increased approximately parabolically with the DO concentration up to 5 mg/liter. The presence of starch in the simulated sewage containing 15 ppm ammonia nitrogen did not have any major effect on the oxidation rate. The removal rates were 0.149, 0.094, and 0.124 mg NH3-N/liter hr with the presence of starch concentration of 30, 170, and 200 ppm, respectively. Therefore, the presence of organic compounds could not be considered as a major inhibitory factor for biological nitrification. (Katayama-FIRL)
W76-05589

BIOMASS DISTRIBUTION AND KINETICS OF BAFFLED LAGOONS,
Utah State Univ., Logan.
J. H. Reynolds, S. B. Nielson, and E. J. Middlebrooks.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 101, No. EE6, p 1005-1024, December, 1975. 6 fig, 9 tab, 25 ref.

Descriptors: *Kinetics, *Lagoons, Model studis, *Biological treatment, Biodegradation, Monitoring, Suspended solids, *Wastewater treatment, Biomass, Distribution.
Identifiers: *Biomass distributions, Baffled waste stabilization ponds.

Performance, biological responses, and kinetics of three baffled model waste stabilization ponds were compared to those of an unbaffled model waste stabilization pond to determine the effects of baffle configurations and increasing submerged surface area. Three kinetic models were developed: a first-order completely mixed flow model, a model with materials balances and completely mixed flow, and a first-order growth model with a plug-flow reactor configuration. The submerged surface areas of the baffled ponds were equal and the environmental factors affecting pond performance were identical for all ponds. The ponds were illuminated with fluorescent lights and fed a synthetic waste. Performance and biological responses were monitored during several different detention times. Results of monitoring and analyses of the ponds' various elements are given in tables and graphs. A dense layer of scum on the surface of the model pond liquid apparently increases odorous gases emitted from the pond, decreases the kinetic rate of biodegradation, decreases the pH, and decreases the amount of suspended solids. At a detention time of 15 days there was little difference among the pond configurations in the amount of organic carbon removal, but at a detention time of 1.5 days the difference was between 53% and 70%. Biological degradation rates were significantly higher in the baffled ponds than in the control pond, with the longitudinal baffle configuration providing the highest rate of reduction of soluble organic carbon concentrations. (Loustau-FIRL)
W76-05590

TECHNICAL-ECONOMIC PRODUCT DESIGN AS TYPIFIED BY A SEWAGE PUMPING INSTALLATION,
E. Arn, F. Schaer, and A. Trachsel.
Sulzer Technical Review, Vol. 57, No. 3, p 169-176, 1975. 9 fig, 7 tab, 6 ref

Descriptors: *Sewage treatment, Pumps, Economics, Sewage lagoons, Equipment, Engineering, Operation, Maintenance, Design criteria, Planning, *Pumping, *Waste water treatment.
Identifiers: Value analysis.

A sewage pumping installation has been used as an example to describe the overall development of integrated technical-economic design and manufacture of engineering products. Waste water pumps are required to transfer domestic and industrial effluents, which have been collected in ponds, to a sewage treatment plant. In this case, public concern about sewage pumps has stressed the danger of clogging, and the need for high reliability, quiet operation, and an odor-free system. The four concerns--uncloggability, smell propagation, noise propagation, and motor reliability--were considered as one type of assessment criterion and were evaluated according to technical values. Other assessement criteria--excavation, concreting, maintenance, pipework and fittings, and installation work--were rated in terms of economic values. Operating data, including flow, pressure increase, speed, efficiency, and pump drive input were also compared. Basic sketches of positive displacement, fluid flow, and other types of pumps were prepared. By combining solution principles to achieve an overall function, procedures may be decided. With the aid of a value analysis technique, the technical and economic optimal pumping system may then be selected. (Kramer-FIRL)
W76-05591

EFFECT OF THE OPERATIONAL TEMPERATURE IN REVERSE OSMOSIS METHOD (GYAKU SHINTO HO NI OKERU SOSA ONDO NO EIKYO),
K. Kitao, M. Sugawara, and H. Ozaki.
Preprint, Japan Society of Civil Engineers, Tokyo, p 532-533, 1975. 7 fig.

Descriptors: *Reverse osmosis, *Membrane processes, *Temperature, *Pressure, Viscosity, Permeability, Solvents, Solutes, Surfactants, Analytical techniques, *Waste water treatment.

The effect of temperature on the permeability of solvents and solutes in reverse osmosis was studied, using an acetylcellulose membrane. The solvents studied were pure water, methyl alcohol, ethyl alcohol, and n-propyl alcohol, while the solutes studied were NaC1, HgC12, and three surfactants in aqueous solution, all with a solute concentration of less than 10 mmole. Permeability was varied by changing the pressure between 0.5 and 50 kg/sq cm and the temperature between 3 and 31.5 C. At a constant pressure and temperature the membrane permeability (K) decreased with the increased viscosity of the solvents. With variable temperatures, the membrane permeability was inversely proportional to the change in the viscosity of the given solvent at a given temperature, and the product between its K value and viscosity was nearly constant. For the solute in an aqueous system, there was a linear relationship between the solute permeation rate and the solution permeation rate for a constant temperature. The slope of the line became more steep when the high temperature was used, which indicated that the absorbed amount of solute within the membrane increased with lower temperature. The solute permeation rate increased more rapidly by changing temperature than by changing pressure even when the same solution permeation rate was obtained. (Katayama-FIRL)
W76-05592

HOW DOES TANK GEOMETRY AFFECT THE OXYGEN TRANSFER RATE OF MECHANICAL SURFACE AERATORS.
Envirex, Inc., Waukesha, Wis. Water Quality Control Div.
R. Kormanik.
Water and Sewage Works, Vol. 123, No. 1, p 66-67, January, 1976.

Descriptors: Oxygen, *Aeration, Equipment, Tanks, Laboratory tests, Analytical techniques, Data collections, *Waste water treatment.
Identifiers: *Oxygen transfer rates, Basin geometry, *Aerator speeds.

To determine the influence of test basin geometry on the oxygen transfer capabilities of mechanical surface aerators, tests of three types of surface aerators were conducted in six geometric test tank configurations. The three types of aerators tested were the high speed-high trajectory, high speed low trajectory, and a low speed bridge mounted unit. The test basin geometry was varied by using an 80 ft by 80 ft by 20 ft deep tank and partitioning it into quarter and half sizes. The aerators were tested at 12 ft and 18 ft depths at 15, 30, 50, and HP speeds. The oxygen transfer rate of a surface mechanical aerator at standard conditions was affected by the water depth of the test basin. The correlation between oxygen transfer rate and basin surface area was much closer than the correlation between oxygen transfer rate and basin volume. Because of this finding, it was recommended that when a standard transfer rate is quoted, the associated value of surface area should also be indicated. For high speed aerators, the lower the aerator horsepower, the greater the influence of basin geometry. The oxygen transfer rate of the low speed aerators at standard conditions was less affected by basin geometry than that of the high speed type. (Loustau-FIRL)
W76-05593

STREAM ANALYZERS ARE FOR WASTE AS WELL AS PRODUCT,
For primary bibliographic entry see Field 5A.
W76-05596

LIME-INDUCED REACTIONS IN MUNICIPAL WASTEWATERS,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
D. T. Merrill, and R. M. Jorden.
Journal Water Pollution Control Federation, Vol. 47, No. 12, p 2783-2808, December, 1975. 11 fig, 29 ref.

Descriptors: *Model studies, *Waste water treatment, *Lime, Chemical precipitation, Municipal wastes, Mathematical models, Phosphate, *Chemical reactions.

If steady-state soluble constituent concentrations can be attained within reasonable times in lime-treated raw waste systems, then the interaction of lime and the constituents of municipal waste water can be described through equilibrium-based mathematical models. The models can interpret system reaction phenomena and identify limitations that designers and treatment plant operators must face. Experiments were carried out with raw, degritted waste water and additions of lime of 150, 250, and 350 mg/liter so that data might be obtained over the pH range of effective phosphate precipitation. The waste water and lime samples were analyzed for soluble Ca sub t, CO sub 3t, PO sub 4t, and Mg sub t, and the results recorded on a graph. Then the equilibrium behavior of lime-treated waste at simulated conditions was calculated by application of water chemistry theory. Analyses indicated that total phosphate residuals are insensitive to initial waste concentration at pH values greater than or equal to 10, suggesting that pH could be a good control parameter in regard to PO4 removal. Lime treatment will neither soften water nor eliminate salt efficiently. Lime requirements and the mass of chemical sludge produced are highly dependent on the initial waste CO sub 3t concentration. Lime requirements run 10 to 50 percent higher than theoretically predicted because lime only partially dissolves. Increasing the ratio PO sub 4t:CO sub 3t in the initial waste water may, in some cases, produce substantial processing economies. (Loustau-FIRL)
W76-05597

OPTIMAL DESIGN MODEL FOR WASTE WATER COLLECTION SYSTEM (II) GESUIDOKAN KIYO KEIKAIU NO SAITEKIKA MODERU TO SONO OYO (II)),
K. Yamada.
Ritsumeikan Daigaku Rikogaku Kankyusho Kiyo, Memoirs of the Research Institute of Science and Engineering, Ritsumeikan Univ.), No. 28, p 17-28, 1975. 13 fig, 9 tab, 18 ref.

Descriptors: *Model studies, *Economics, Construction costs, *Waste water treatment, Mathematical models, Variable costs, Optimization.

A three dimensional model to determine the optimal waste water collection system has been proposed. The model was constructed on the assumptions that the number of arcs was 25, the length of each arc was 250 m or 500 m, the number of rankings for the excavation depth was 10, the width of each ranking was 25 cm or 50 cm, the maximum flow rate was 2.5 m/sec, the minimum flow rate was 0.6 m/sec, and the rate of waste water generation was 2 liters/sec/10,000 sq m. The model employed ten different factors, each of which had two different values assigned. These factors and their assigned values were: x-directional gradient of the upper stream, 0.5 and 1.0; x-directional gradient of the lower stream, 0.5 and 2.0; y-directional gradient of the upper stream, 0.5 and 2.0; y-directional gradient of the lower stream, 0.5 and 2.0; additional flow rate increase factor, 1.0 and 1.2; additional main sewage line construction cost increase factor, 0.0 and 0.2; flow rate variation, 0.0 and 0.2 Q; groundlevel variation, 0.0 and 0.1 m; construction cost variation, 0.0 and 0.1 C; and excavation depth of the final node, 4 m and 2 m. Using sixteen combinations of values for the ten factors, the total construction costs for each combination were calculated; the range of costs was between $555,300 and $1,984,000. An analysis of variance was made for the calculated results to see the effect of the factors on the derived construction costs. The factors of groundlevel variation, x-directional gradient of the lower stream, and y-directional gradient of the lower stream contributed 84% of the variation in construction costs. (Katayama-FIRL)
W76-05598

PROCEEDINGS - CONFERENCE ON WATER CONSERVATION AND SEWAGE FLOW REDUCTION WITH WATER-SAVING DEVICES.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 999, $7.75 in paper copy, $2.25 in microfiche. Information Report Number 74, July 1975, 216 p, Conference held April 8-10, 1975, Pennsylvania State University. Edited by W. E. Sharpe and P. W. Fletcher. OWRT A-038-PA(1). 14-31-0001-4038.

Descriptors: *Water conservation, *Water resources development, *Water reuse, Water treatment, Ultimate disposal, Sewage treatment, Sewage disposal, Consumption use, Reasonable use, Water utilization, Waste water treatment, Technology, Reviews.
Identifiers: *Water-saving devices, *Water use reduction, *Resource management.

These proceedings are a current state-of-the-art assessment of water-saving device technology in the United States. The papers address themselves to the major questions associated with water-saving device development and use. The gaps in current knowledge are enumerated and the information necessary to fill these gaps is identified. The information contained in these proceedings will be of benefit to a broad spectrum of concerned individuals from the researchers to the facilities manager. Water conservation will be a definite part of America's future and water-saving devices have already begun to take their place in this conservation effort. Water resources development grows more expensive each day, as does the cost of treating the inevitable flow of wastes resulting from most water uses. Water use reduction with water-saving devices offers a major opportunity to alleviate some of these most pressing resource management problems. (Sink-Penn State)
W76-05602

FOR WHICH LOAD SHALL MUNICIPAL PURIFICATION PLANTS BE DIMENSIONED. (FUER WELCHE BELASTUNG SOLLEN KOMMUNALE KLAERANLAGEN BEMESSEN WERDEN),
J. Gruhler.
Wasserwirtschaft-Wassertechnik, Vol. 25, No. 11, p 364-368, 1975. 2 fig, 9 ref.

Descriptors: *Biological treatment, *Municipal water, *Treatment facilities, *Model studies, Organic compounds, Water quality control, Biochemical oxygen demand, *Waste water treatment.
Identifiers: Dimensioning, Post-treatment basins, Waste discharge.

Considerations in the dimensioning of municipal biological waste water treatment plants are presented. The waste water discharge for which these treatment plants should be dimensioned is determined from measurements of discharge and organic matter load, and the long-term evaluation of these parameters should be considered. The purification efficiency is determined by the water quality of the recipient. The fluctuations in the quantity of the incoming waste water should be considered mainly in the dimensioning of the post-treatment basin rather than in that of the aeration basin. The minimum residence time in the post-treatment basin should not be shorter than 1.5 hours. Biological waste water treatment plants should be dimensioned for a daily BOD load in kg/day of water discharged into the effluent, and not for hourly peaks, as short-term BOD peaks represent no hazard for the recipient. (Takacs-FIRL)
W76-05609

NOMOGRAMS FOR SIMPLIFIED HYDRAULIC DIMENSIONING OF WASTE WATER DUCTS (NOMOGRAMME ZUR VEREINFACHTEN HYDRAULISCHEN BEMESSUNG VON ABWASSER-KANAELEN),
M. Szalay.
Gas-und Wasserfach-Wasser/Abwasser, Vol. 116, No. 9, p 415-417, September, 1975. 3 fig.

Descriptors: *Model studies, *Waste water treatment, *Pipes, *Flow velocity, Sewers, Mathematical studies, Hydraulics.
Identifiers: *Nonograms, Waste water ducts.

A simplified nomogram for the dimensioning of waste water ducts, obtained by an integration of filling curves and the usual dimensioning nomograms, is described for circular and egg-shaped duct sections. The new nomogram makes it possible to obtain the dimensioning data in a single step. The nomograms developed for circular and egg-shaped sections permit the determination of the necessary pipe diameter, the mean water flow velocity, the water depth, and the time required for the water to clear a 100 meter section, as a function of the discharge rate and of the gradient of the sewer. (Takacs-FIRL)
W76-05610

PERSPECTIVE 75.
East Central Florida Regional Planning Council, Winter Park.
For primary bibliographic entry see Field 6B.
W76-05651

PROCESSING OF SEDIMENTS FROM COAGULATION APPLIED AS THE THIRD STAGE OF EFFLUENT PURIFICATION (PRZERABIANIE OSADOW POWSTAJACYCH PRZY ZASTOSOWANIU KOAGULACJI JAKO TRZECIEGO STOPNIA OCZYSZCZANIA SCIEKOW Z PRZEMYSLU WLOKIENNICZEGO),
Centralne Laboratorium Dziewiarstwa (Poland).
J. Rouba.
Przeglad Wlokienniczy, Vol. 29, No. 9, p 452-455, Sept., 1975. 5 ref, 6 tab.

Descriptors: *Waste water treatment, *Coagulation, *Sludge, Waste treatment, Waste, Calcium hydroxide, Color, Biochemical oxygen demand, Suspended solids, Filtration, Sedimentation, Textiles, Water pollution sources, Water pollution treatment, Water pollution control, Tertiary treatment.

Coagulation as the third treatment stage in sewage purification has been used for a long time. In a case of industrial effluents, coagulation usually constitutes a preliminary process to biological purification or a single-stage process. It yields large quantities of highly hydrated sediments, very difficult to process. Frequently, the effluents are purified biologically without preliminary coagulation. Such purified effluents, in the particlar case of the textile industry frequently do not meet the present antipollution regulations and must be subjected to further purification. The results are given of a study of additional purification by coagulation of

effluents that have been treated mechanically and by the activated sludge process, to remove their color and various residual impurities. The study was conducted on an effluent with a dry solids content of 3160 mg/cu dm and a 5-day BOD of 250 mg/cu dm. Coagulation was done with 400-450 mg calcium hydroxide/cu dm and 200-250 mg ferrous sulfate/cu dm. Complete removal of color and a reduction of 40-45% BOD and of 50% suspended solids were obtained. The sediments were concentrated by gravity and by vacuum and pressure filtration. In all cases the efficiency was high; a 10-fold reduction of the initial volume. Sedimentation took 2-4 hr, and the filterability was good. The results are attributed to the presence of carbon dioxide in the biologically purified effluent yielding, upon reaction with calcium hydroxide, a crystalline sediment. (Stapinski-IPC)
W76-05697

USE OF ION EXCHANGERS AND SYNTHETIC SORBENTS FOR REMOVAL OF COLOR FROM KRAFT PROCESS EFFLUENTS (PROBY ZASTOSOWANIA JONITOW I SORBENTOW SYNTETYCZNYCH DO USUWANIA BARWY ZE SCIEKOW POSIARCZANOSYCH),
Technical Univ., Lodz (Poland).
S. Wiktorowski, P. Anielak, and M. Kubik.
Przeglad Papierniczy, Vol. 31, No. 9, p 331-334, Sept., 1975. 7 fig, 17 ref, 3 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Color, *Ion exchange, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Lignins, Hydrogen ion concentration, Waste treatment, Water purification, Separation techniques, Activated carbon, Sorption.
Identifiers: Indulin C, Amberlite IRA-900, Zerolit KMP, Zerlit NIP, Amberlite XAD-2, Wofatit KPS.

The effectiveness of synthetic sorbents and ion-exchangers in removing color components (i.e., alkali lignin from kraft mill effluents) was studied under laboratory conditions on a model effluent, i.e., solutions of Indulin C (unpurified sodium salts of kraft process lignins). The color intensity depended on concentration and on the pH. There was little change of intensity within the pH range 3-9, but a sharp increase at higher pH. The solutions used in the study had a concentration ranging from 82 to 410 mg/cu dm, based on oven-dry Indulin. The color intensity at pH 7 raged from 500 to 2500 mg Pt/cu dm. The following preparations were tested: strongly alkaline anion exchangers Amberlite IRA-900, Zerolit KMP, and Zerolit NIP; GM-800 exchangers of medium alkalinity; synthetic sorbent Amberlite XAD-2; nd the strongly acidic cation exchanger Wofatit KPS. For comparison purposes, experiments were also carried outwith activated carbon as sorbent. Sorption of Indulin was conducted under dynamic conditions in columns filled with the sorbents, and the sorption effectiveness was determined by measurements of the optical extinction of eluent fractions at 420 nm. The ion-exchanger GM-800 (guanidine-melamine resin) was the most effective, removing from 54 to 89% of the color, depending of the initial color intensity. Amberlite XAD-2 was quite effective at low pH (2 or below). (Stapinski-IPC)
W76-05698

HYDRAULIC LOAD FLUCTUATION IN EFFLUENT TREATMENT PLANTS (HYDRAULICKE NARAZY NA SEDIMENTACNI CISTIRNY ODPADNICH VOD),
P. Sochan.
Papir a Celuloza, Vol. 30, No. 11, p 251, 1975. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Flow, *Model studies, Effluents, *Pulp and paper industry, *Wastes, Industrial wastes, Water pollution sources, Water pollution contrl, Waste dilution, Surge tanks, Hydraulic systems, Hydrodynamics.

For a paper mill which has, besides a white water circuit, an effluent treatment plant with partial reuse of the treated water, an empirical unsteady-state model was developed to study hydraulic load fluctuations. The results showed that, for the time base of 15, 60, and 120 minutes, the average hydraulic load changed by plusor minus 80%, plus or minus 40%, and -20 to +40%, respectively. To reduce the extent of flow fluctuations, a reduction in tank volumes for diluted stock and stock dilution water is recommended. Another, though costly, alternative for the elimination of hydraulic load fluctuation is the installation of a surge basin ahead of the treatment plant. (Trubacek-IPC)
W76-05699

INFLUENCE OF TEMPERATURE ON BIOLOGICAL PURIFICATION OF PAPER MILL EFFLUENT (INFLUENZA DELLA TEMPERATURA SULLA DEPURAZIONE BIOLOGICA DI UN REFLUO DI CARTIERA),
V. Scarlata, E. Porrozzi, R. Bignazzi, and R. Caminada.
Cellulosa e Carta, Vol. 26, No. 10, p 26-41, Oct., 1975. 13 fig, 35 ref, 1 tab.

Descriptors: *Pulp wastes, *Activated sludge, *Waste water treatment, *Temperature, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Efficiencies, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Stabilization, Sludge, Biochemical treatment, Design, Treatment facilities, *Biological treatment.

Two activated-sludge pilot plants operating at 20 and 4 C, respectively, were compared with respect to efficiency. Both were run on the same pulp/urea-based substrate. The plant operating at the higher temperature was found to be more efficient in most respects. Maximum reduction in BOD, COD, and suspended solids were on the order of 20-30%. Activated sludge stabilization was also much quicker at 20 C. However, at 4 C, there was less excess sludge, and its physical behavior was more satisfactory. The results obtained show that operating temperature should always be taken into account in designing biological treatment plants. (Speckhard-IPC)
W76-05700

ENERGY REQUIREMENTS FOR CONVENTIONAL AND ADVANCED WASTEWATER TREATMENT,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
G. D. Zarnett.
Ontario Ministry of the Environment, Applied Sciences Section Pollution Control Branch Publication No. W47, 33 p, Oct., 1975. 6 fig, 5 ref, 11 tab.

Descriptors: *Waste water treatment, *Tertiary treatment, *Energy, Waste treatment, Electric power, Operation and maintenance, Chemicals, Operating costs, Equipment, Lime, Aluminum sulfate, Chlorine.

The energy demand for operation of conventional and advanced effluent treatment systems are compared, including not only electrical power but also the energy needed to produce treatment chemicals, notably lime, alum, and chlorine. When this is taken into account, the advanced treatments show substantial increases in total energy consumption over conventional systems. The power increment resulting from the addition of lime and alum coagulants/flocculants ranges from 40 to 84%, whereby increments above 50% indicate that the energy required for chemical generation is greater than the electrical power needs of the effluent treatment system. While electric operating energy is comparable for both simple and advanced treatments, total energy needs of advanced systems are one order of magnitude greater than for conventional installations. Electrical equipment (pumps, agitators, mixers, rakes, skimmers, blowers, vacuum filters, vibratory screens, centrifugal separators, etc.) consumes power in exponential proportion to plant size or capacity, whereas the increase of chemical energy with plant capacity is a linear function of applied dosage. (Brown-IPC)
W76-05702

STUDY OF TURBINE MIXERS FOR FLOW-THROUGH FLOCCULATION CHAMBERS (VYZKUM TURBINOVYCH MICHADEL PRO PRUTOCNE FLOKULACNI KOMORY),
Vyzkumny Ustav Chemickych Zarizeni, Brno (Czechoslovakia).
P. Seichter.
Chemicky Prumysl, Vol. 25, No. 9, p 453-462, Sept., 1975. 9 fig, 24 ref, 7 tab.

Descriptors: *Waste water treatment, *Mixing, *Turbines, Equipment, Waste treatment, Model studies, Engineering, Flocculation, Flow characteristics, Foreign research, Wastes, Water pollution treatment, Europe.
Identifiers: *Czechoslovakia.

In connection with the optimization of water treatment equipment, an engineering study of turbine mixers was carried out. A flow model for the determination of the detention time in a chamber with four mixing sections was developed. The ON 691021 (Czechoslovakia) was found to be the most suitable type of mixer for a flocculation chamber. With regard to the use of the model characteristics for the design of large flocculation chambers, it is pointed out that the scaling-up can be done based on geometric similarity, but the peripheral velocity of the mixer should be kept constant. (Trubacek-ipc)
W76-05703

EXPERIMENTS ON THE OPTIMIZATION OF SLUDGE DEWATERING AND ON THE USE OF BARK AND SLUDGE IN THE BRICK INDUSTRY (VERSUCHE ZUR OPTIMIERUNG DER SCHLAMMENTWAESSERUNG UND ZUR VERWERTUNG VON RINDE UND SCHLAMM IN DER ZIEGELINDUSTRIE),
Papiertechnische Stiftung, Munich (West Germany).
G. Schweizer.
Wochenblatt fuer Papierfabrikation, Vol. 103, No. 22, p 833-839, Nov. 30, 1975. 9 fig, 11 illus, 25 ref, 1 tab.

Descriptors: *Pulp wastes, *Sludge treatment, *Sludge disposal, Water pollution sources, Wastes, Industrial wastes, Dewatering, Zeta potential, Flocculation, Waste water treatment, Sludge, Bark, Wood wastes, Fuels, Transportation, Costs, Pulp and paper industry, Clays, Construction materials.
Identifiers: *Bricks.

A brief discussion of flocculation and dewatering of paper mill wastes is followed by a description of experiments on effluents from a coated paper mill showing the relationship between SCD (streaming current detector) zeta-potential value, amount of flocculant added, and sludge separation. The addition of sludge to clay in brickmaking lowers brick density and produces increased porosity and finer pore structure. This is due largely to the fiber content of the sludge; a combination of sludge with bark seems promising, but bark, like other wood residues, is a useful fuel. Brick factories are idle usually in winter and could not, in any case, utilize all the sludge from a large paper mill, but even partial utilization would reduce disposal and transport costs. Besides, both fiber and mineral content are used in the brick, whereas disposal by burning requires some capital costs and disposal of the ash. (Ward-IPC)
W76-05704

RAPID DETERMINATION OF THE COD OF EFFLUENTS (USKORENNOE OPREDELENIE KHPK STOCHNYKH VOD),
Tsentral'nii Nauchno-Issledovatel'skii i Proektnii Institut Lesokhimicheskoi Promyshlennosti, Khimki (USSR).
For primary bibliographic entry see Field 5A.
W76-05705

SUPER TEAMWORK GIVES GREEN BAY (WISCONSIN) A SUPER WASTE TREATMENT PLANT,
K. Boiko.
Paper Trade Journal, Vol. 159, No. 27, p 32-36, Dec. 1, 1975. 3 fig, 1 ref, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Wisconsin, *Activated sludge, *Treatment facilities, Water pollution source, Waste, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution control, Sewage treatment, Biological treatment, Capital costs, Municipal wastes.
Identifiers: Green Bay Metropolitan Sewerage District(Wisc), Fox River(Wisc).

After pilot plant studies with different modifications of the activated sludge process conventional, step aeration, contact stabilization, and the Kraus process), two paper mills and the Green Bay Metropolitan Sewerage District signed a contract to treat mill wastes together with city sewage in a $72 million waste treatment facility located on 92.9 acres at the mouth of the Fox River. The treatment plant started up with 22 million gallons/day (mgpd) of sewage from the metropolitan area and 17.5 mgpd from the mills. Total design capacity is for an eventual flow of 52 mgpd. In the treatment process, mill effluent enters the plant at the pumping station. It bypasses the primary treatment (screening and first settling basin) and proceeds directly to the biological treatment stage. Solids accumulated from these two phases proceed to the third phase where they are transformed into sterile ash and gas. The gases are washed and filtered to meet air quality standards. Odorous gases are collected and burned, and residual ash is disposed of at landfill sites. (Sykes-IPC)
W76-05706

LAB-PROVEN FLY ASH PROCESS REMOVES BLEACH EFFLUENT COLOR,
T. S. Nasr, R. G. Gillies, N. N. Bakhshi, and D. G. Macdonald.
Canadian Pulp and Paper Industry, Vol. 28, No. 9, p 30-32, 35, Sept., 1975. 4 fig.

Descriptors: *Bleaching wastes, *Color, *Waste water treatment, *Fly ash, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Chemical oxygen demand, Hydrogen ion concentration, Chemical precipitation, Metals, Ions, Pulp wastes, Electric powerplants, Coals, Fuels, Chemical reactions, Sludge.
Identifiers: Hydrogen chloride.

A method is described for removing most of the color from pulp mill effluent by using HCl and fly ash from coal-burning electricity generating plants, based on research conducted at the University of Saskatchewan. With untreated fly ash, extremely large doses were required to obtain 51% color removal. Effluent samples were treated with various dosages of completely HCl-acidified fly ash, and the filtered to determine COD, color, and pH of the filtrate samples. A maximum 98% color removal and 88% COD removal were obtained with a disage of 1.9 g fly ash/liter of undiluted effluent (12,000 APHA color units, 2480 ppm COD) and an optimum pH of 5.0. Acidification of the effluent contributed to some of the color decrease during treatment with acidified fly ash, but most of the color removal was the result of precipitation of colored material by reaction with metal ions released from fly ash. Sludges formed by such treatment did not leach to any significant extent. (Sykes-IPC)
W76-05707

ELECTROLYTIC COAGULATION OF LIGNIN FROM KRAFT MILL BLEACH PLANT WASTE-WATERS,
Main (Charles T.), Inc., Boston, Mass.
D. O. Herer, and F. E. Woodard.
Tappi, Vol. 59, No. 1, p 134-136, Jan., 1976. 5 fig, 15 ref, 1 tab.

Descriptors: *Waste water treatment, *Lignins, *Coagulation, *Electrolysis, *Bleaching wastes, Pulp wastes, Water pollution sources, Water pollution treatment, Water pollution control, Wastes, Waste treatment, Industrial wastes, Flotation, Aluminum, Ions, Anodes, Chlorides, Cathodes, Economics, Color, Chemical reactions.
Identifiers: Aluminum compounds.

The feasibility of using electrolytic coagulation to remove color and other carbonaceous materials from kraft pulp mill bleach plant waste water was studied. Removal mechanisms were found to consist of coagulation by hydrated aluminum ions which were brought into solution by electrolytic dissolution of the aluminum anode. Bleaching of small color-causing polymers by chlorine formed by oxidation of chloride ions at the anode was shown to be improbable. Hydrogen bubbles formed at the cathode aided removal of coagulated polymers by a flotation action. The optimization of process parameters was considered in view of such a removal mechanism, and the economic feasibility of a full-scale unit was evaluated. (Sykes-IPC)
W76-05708

ANALYSIS OF PULP AND PAPER MILL WASTE WATERS BY HIGH-RESOLUTION ION-EXCHANGE CHROMATOGRAPHY,
Oregon Univ., Portland.
For primary bibliographic entry see Field 5A.
W76-05709

SYMPOSIUM ON WATER PURIFICATION (SYMPOSIUM OVER VATTENRENING),
O. Brauns.
Svensk Papperstidning, Vol. 78, No. 18, p 633-638, Dec. 20, 1975. 2 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, *Conferences, Water pollution sources, Water purification, Waste treatment, Wastes, Industrial wastes, Economics, Technology, Foreign countries, Europe.
Identifiers: *Sweden, Scandinavia.

A fairly detailed report is presented on a symposium devoted to biological pulp and paper mill effluent treatment organized on November 12, 1975 by Purac AB. and Hylte Bruks AB. Practical waste water cleanup experiences of three Swedish mills (Hyltebruk, Hallstavik, and Boksholm) are discussed, including economic, policy, and technological problems. (Brown-IPC)
W76-05711

BIOLOGICAL TREATMENT BY A SYSTEM OF ACTIVATED SLUDGE APPLIED TO THE EFFLUENT WATERS OF A CORRUGATED BOARD PLANT,
Centro di Sperimentazione Cartotecnica, Milan (Italy).
V. Scarlata, and E. Porrozzi.
Proceedings XIII FEFCO (Federation Europeenne des Fabricants de Carton Ondule) Congress (Venice), May 20-24, 1974. 15 p, 2 fig, 17 ref, 2 tab.

Descriptors: *Activated sludge, *Biological treatment, *Waste water treatment, *Chemical wastes, Water pollution sources, Wastes, Industrial wastes, Water pollution treatment, Water pollution control, Chemical oxygen demand, Biochemical oxygen demand, Microorganisms, Toxicity, Nutrients, Phosphorous compounds, Nitrogen compounds, Aluminum sulfate, Sludge, Sedimentation, Effluents, Pulp and paper industry.
Identifiers: *Inks, *Printing industry, *Converting plants(Paper processors), Corrugated board, Corrugated boxes, Flexographic inks, Graphic arts industry.

A laboratory pilot plant was used to examine the feasibility of activated sludge plus total bio-oxidation treatment for effluents of a converting plant making corrugated boards and printed boxes. For satisfactory purification, the printing effluent had to be treated separately, owing to the toxicity of flexographic inks toward activated sludge microorganisms. Also, P, N, and alum had to be added as nutrients and to improve sludge sedimentation. Under these beneficial conditions, the activated sludge plant removed 92.6% BOD and 88.4% COD of the influent within 2.5-hr treatment time, compared to 96.2% BOD and 91.3% COD removal within 24-hr by the total bio-oxidation plant. Dye-contaminated printing effluents will require a separate physicochemical treatment, or the inks will have to be replaced by less toxic ones. (Brown-IPC)
W76-05713

STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION,
Crown Zellerbach Corp., Camas, Wash.
For primary bibliographic entry see Field 5G.
W76-05714

EXPERIMENTAL STUDY OF THE PURIFICATION OF EFFLUENTS FROM THE MANUFACTURE OF BLEACHED BISULFITE PULP BY AERATION LAGOONING (ETUDE EXPERIMENTALE DE L'EPURATION PAR LAGUNAGE AERE DE LIQUEURS BISULFITIQUES DE PATE DE CELLULOSE BLANCHIE),
Bordeaux Univ. (France).
A. Chantefort, M. Marchand, and J. Sechet.
Tribune de CEBEDEAU, Vol. 27, No. 367/368, p 294-302, 1974. 5 fig, 6 ref, 6 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Aerated lagoons, Sulfite liquors, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Water pollution treatment, Water pollution control, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Nutrients, Chlorine, Microorganisms, Lagoons, Aeration,Color, Lignins, Phenols.

The study was conducted on effluent from a pulp mill producing two types of ammonium-base sulfite pulp, a papermaking pulp and a dissolving pulp, from a mixture of Maritime pine and hardwood. The pulps are bleached by a CHD (chlorine/hypochlorite/chlorine dioxide) sequence. The spent sulfite liquor is concentrated and burned, so that the effluents to be purified include the effluent generated by spent sulfite liquor evaporation (30% of BOD), pulp wash water (34% of BOD), and the bleaching effluent (36% of BOD). The total amount of these effluents is 60,000 cu m/day. The following aspects of the treatment, evaluated in terms of BOD and COD reductions, were considered: optimum initial pH, addition of nutrients, effects of BOD load and of the presence of chlorine, and the microflora evolution during the course of treatment (up to 9 days). The data show that under optimum conditions (initial pH of about 5, elimination of chlorine, addition of nutrients, and possible microbial inoculations) a reduction of BOD of up to 90% and of COD of about 50% can be achieved. The lagoon needed would have to be of 300,000 cu m capacity and be equipped with means for maximum aeration and for homogeneous distribution of additives (nutrients and alkali for pH adjustment). A

problem remaining to be solved is the strong coloration of the purified effluents, caused by partial oxidation of phenolic compounds originating from lignin. (Stapinski-IPC)
W76-05718

BLEACH PLANT POLLUTION ABATEMENT -- WHERE DO WE STAND,
Hooker Chemicals and Plastics Corp., Niagara Falls, N. Y.
E. S. Atkinson.
Canadian Pulp and Paper Industry, Vol. 28, No. 9, p 22-24, Sept., 1975. 17 ref, 3 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, Recycling, Effluents, Water pollution sources, Water pollution control, Water pollution treatment, Pollutants, Color, Biochemical oxygen demand, Toxicity, Chemical oxygen demand, Chlorides, Costs, Resins, Ion exchange, Energy, Water conservation, Pollution abatement, Pulp and paper industry.
Identifiers: Oxygen bleaching, Kraft mills, Chemical recovery.

Work aimed at using bleach plant effluent in the pulp mill recovery cycle is reviewed. Oxygen bleaching offers the possibility of recycled effluent, but the process is not sufficiently developed to solve the pollution abatement problem. Tables indicate the approximate distribution of pollutants (color, BOD, toxic constituents, COD, and chlorides) between bleaching stages; the estimated cost of external pollution abatement for a kraft pulp mill; and cost of pollution abatement at different BOD levels. Hooker Chemicals and Plastics Corp. (New York) APS projects for assisting the industry in antipollution efforts are discussed. APS-1 is designed to reduce effluent color through changes in bleaching sequences and conditions. With APS-2, chlorination is replaced by sequential chlorination, but at a chlorine dioxide substitution as high as 75-80%, to minimize the chloride content of bleach plant liquors. In APS-3, acid effluent is treated with a color-absorbing macroporous resin. The resin is regenerated with alkaline extraction liquor, and the effluent is added to other alkaline extraction liquors going to the recovery/cooking cycle. It is suggested that a countercurrent pulp washing system is a necessary requirement for establishing a pollution abatement program. The closing up of the bleach plant is also an energy- and water-saving step. (Sykes-IPC)
W76-05719

PURIFICATION OF WASTE WATERS AT THE KRAFT MILL OF 'LA CELLULOSE DES ARDENNES' (EPURATION DES EAUX RESIDUAIRES A LA CELLULOSE DES ARDENNES),
G. Berwart.
Technique de l'Eau et de l'Assainissement, Vol. 335, p 51-57, 1974. 3 fig, 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Biological treatment, Bleaching wastes, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Sludge treatment, Sludge disposal, Biochemical oxygen demand, Efficiencies, Water purification, Foreign countries, Filtration, Landfills, Europe, Costs, Operating costs.
Identifiers: Kraft mills, France.

A kraft pulp mill located in Harnoncourt (France) began its operations in 1964. Its initial capacity of 200 tons of bleached pulp/day has been increased recently to 500 tons. The pulp is produced exclusively from local hardwoods (beech, hornbeam, birch, and oak) and is bleached in a five-stage process including a hypochlorite and a chlorine dioxide stage. Black liquor and pulp-washing effluents are evaporated and burned in a soda recovery furnace. Bleaching effluents and evaporation and blow-out condensates are purified by the activated sludge process. The sludge (from primary sedimentation and excess activated sludge) is filtered and disposed of in a landfill or sold as a soil conditioner. The capacity of the biological treatment plant has been increasing at a faster rate than the pulp production, allowing improvements in its efficiency. The BOD of the purified effluent which was 25-40 ppm in 1965, is presently 22 ppm or a 92.6% reduction. A description, including diagrams, is given of the pulp production line and the biological treatment process, and data are presented illustrating the efficiency of the treatment plant. Treatment costs run over 45 million francs annually. (Stapinski-IPC)
W76-05721

POSITION OF A CALCIUM BISULFITE PULP MILL PARTICULARLY WITH RESPECT TO INTENSIFIED ENVIRONMENTAL PROTECTION REQUIREMENTS (DIE POSITION EINER KALZIUMBISULFITFABRIK, BESONDERS IM HINBLICK AUF VERSCHAERFTE UMWELTSCHUTZFORDERUNGEN),
Helsinki Univ. of Technology, Otaniemi Finland.
For primary bibliographic entry see Field 5G.
W76-05722

ESCHER-WYSS FLOTATION CELLS FOR CLARIFICATION AND CLEANING (DIE ESCHER-WYSS FLOTATIONSZELLEN ZUR KLAERUNG UND REINIGUNG),
Escher Wyss G.m.b.H., Ravensburg (West Germany).
W. H. Matzke, and W. H. Siewert.
Das Papier, Vol. 29, No. 10A, p V160-166, Oct., 1975. 11 fig, 5 illus.

Descriptors: *Flotation, *Waste water treatment, *Pulp wastes, Equipment, Cleaning, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, Waste treatment, Operation and maintenance, Design, Separation techniques, Water purification, Suspension, Water quality control, Water pollution control.
Identifiers: Clariflot, Unicell, Deinking, Waste paper.

Flotation is a process for the separation of solid matter from a suspension. If flotation is aimed at the removal of all solid matter contained in the suspension, one speaks of clarification. If, however, selective removal of certain solid matter (e.g., printing ink particles from waste paper) is involved, the fiber suspension is cleaned. For both processes, Escher Wyss GmbH. has developed new devices ('Clariflot' for clarification, 'Unicell' for cleaning) which are described with respect to design and operating principles. They are characterized by small volume for purification and by low specific power and space requirements for cleaning. Operating results with recirculated waste water from washing-deinking units and from paper machines demonstrate the effect of the clarification flotation cells. Through the removal of solids, a desired ash reduction can also be achieved. As regards cleaning, the paper reports on flotation deinking units in which diverse waste papers are processed into bright and clean pulps. (Speckhard-IPC)
W76-05723

OPTIMIZING ORGANIC CARBON AND COLOR REMOVAL FROM A BOARD MILL EFFLUENT,
Saskatchewan Univ., Saskatoon.
G. Goos, C. P. Hwang, and E. Davis.
American Institute of Chemical Engineers (A.I.Ch.E.) Symposium Series, Vol. 70, No. 144, p 213-218, 1974. 10 fig, 6 ref, 2 tab.

Descriptors: *Pulp wastes, *Coagulation, *Waste water treatment, Organic compounds, Carbon, Color, Lime, Cations, Anions, Polyelectrolytes, Water pollution sources, Water pollution treatment, Water pollution control, Wastes, Industrial wastes, Waste treatment, Activated sludge, Calcium carbonate, *Optimization.
Identifiers: Board mills, Aluminum sulfate, Ferric chloride.

Activated sludge treatment of a board mill effluent markedly reduces the strength but leaves a waste high in organic carbon and color. Optimization of coagulation for the removal of these two parameters was undertaken through the use of lime, alum, and ferric chloride in conjunction with cationic, anionic, and nonionic polyelectrolytes at 5-27 C. Ferric chloride was more effective than lime, and lime more effective than alum. Little benefit was obtained from the addition of polyelectrolytes. (Witt-IPC)
W76-05724

CONTROL OF COAGULANT RECOVERY FROM EFFLUENT SEDIMENT (KONTROL' REGENERATSII KOAGULYANTOV IZ OSADKA CTOCHNYKH VOD),
Nauchno-Issledovatel'skii Institut Sanitarnoi Tekhniki i Oborudovania Zdanii i Sooruzhenii, Kiev (USSR).
For primary bibliographic entry see Field 5E.
W76-05725

REDUCTION OF EFFLUENT VOLUME AND FRESH WATER CONSUMPTION (SNIZHENIE OB'EMA CTOCHNYKH VOD I RASKHODA SVEZHEJ VODY),
Vsesoyuznyi Nauchnii Planovii Otdel Bumazhnoi Promyshlennosti Moscow (USSR).
For primary bibliographic entry see Field 3E.
W76-05727

EXPERIENCES AND POSSIBILITIES WITH THE ANDRITZ-SEM DOUBLE WIRE PRESS FOR SLUDGE DEWATERING, PARTICULARLY IN THE PAPER, PULP AND BOARD INDUSTRY (ERFAHRUNGEN UND MOEGLICHKEITEN MIT DER ANDRITZ-SEM DOPPELSIEBPRESSE BEI DER SCHLAMMENT-WAESSERUNG, INSBESONDERE IN DER PAPIER-, ZELLSTOFF-UND KARTO
Maschinenfabrik Andritz A. G., Graz (Austria).
For primary bibliographic entry see Field 5E.
W76-05729

ACTIVATED CARBON TREATMENT OF PULP AND PAPER WASTE WATER,
Sumitomo Jukikai Envirotech, Inc. (Japan).
N. Mimoto, and M. Koseki.
Japan Pulp and Paper, Vol. 13, No. 2, p 49-61, June, 1975. 27 fig, 13 ref, 6 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated carbon, *Tertiary treatment, Wastes, Waste treatment, Industrial wastes, Water pollution sources, Water pollution control, Water pollution treatment, Adsorption, Bleaching wastes, Costs, Properties, Pores, Distribution, Heat treatment, Foreign research, Water quality standards, Pulp and paper industry.
Identifiers: Deinking wastes, Japan, Kraft mills, Groundwood mills.

Primary and secondary treatment of pulp and paper waste waters (e.g., by activated sludge, sedimentation, and filtration) will have to be followed by tertiary treatment if the effluents are to meet water quality standards. Activated carbon treatment is suggested as the best tertiary method. This article reviews briefly activated carbon manufacture, carbon properties (pore size distribution) and other factors affecting adsorption, thermal process for regenerating the spent carbon, and test methods for determining the adsorption capacity. Activated carbon treatment of chemigroundwood, unbleached and bleached kraft mill effluents, kraft bleaching wastes (chlorination and extraction stage effluents), and deinking waste water are

scussed. The cost of carbon treatment in each ıse is estimated. A method for scaling-up a boratory carbon adsorption process to full-size peration is given. (Witt-IPC)
76-05730

LVER IN PHOTOPROCESSING EFFLUENTS,
astman Kodak Co., Rochester, N. Y.
C. Bard, J. J. Murphy, D. L. Stone, and C. J. erhaar.
urnal Water Pollution Control Federation, Vol. , No. 2, p 389-394, Feb., 1976. 1 fig, 11 ref, 5 tab.

escriptors: *Water pollution sources, *Waste ıter treatment, *Heavy metals, *Chemical ıstes, *Photography, Wastes, Industrial wastes, aste treatment, Water pollution control, Water llution treatment, Metals, Biological treatment, xicity, Aquatic microorganisms, Sludge, Lake ıtario.
entifiers: *Silver, Silver compounds, Graphic ts industry, Silver sulfide, Genesse River(New ork), Photographic film, Photographic paper.

lver is generally solubilized as the tightly bound iosulfate complex during processing of photo- aphic paper and film. Data are presented show- that this silver-thiosulfate complex is not harm- to secondary waste treatment plants and is ıch less toxic than ionic silver to other aquatic ganisms. The data show that silver thiosulfate in condary biological waste treatment plants is graded to insoluble silver sulfide, which is moved in the sludge. Thus, essentially all of the ver from photoprocessing is compatible with ological treatment. Analyses have shown that ver concentrations are not excessive in the Ge- sse River (New York) or Lake Ontario near chester, New York, despite a concentration of otographic manufacturing and processing facili- s in this area. (Witt-IPC)
76-05732

STRIBUTION OF LIGNIN IN WATERS OF IE LOURIZAN INLET AS A MEASURE OF ONTAMINATION DUE TO DUMPING OF GNOSULFONIC LIQUORS RESULTING OM PRODUCTION OF CHEMICAL PULP A DISTRIBUCTION DE LA LIGNINA EN UAS DE LA ENSENADA DE LOURIZAN, OMOMEDIDA DE LA CONTAMINACION A USA DEL VERTIDO DE LEJUAS LIGNIN- LFONICAS, PROCEDENTES DE LA BRICACION DE PASTA DE CELULOSA),
r primary bibliographic entry see Field 5G.
76-05733

RIFICATION OF GUM ROSIN PRODUCING ANT EFFLUENTS FROM RESINOUS SUB- ANCES (OCHISTKA STOCHNYKH VOD NIFOL'NOTERPENTINNOGO PROIZ- DSTVA OT SMOLISTYKH VESHCHESTV),
ntral'nii Nauchno-Issledovatel'skii i Proektnii titut Lesokhimicheskoi Promyshlennosti, imki (USSR9.
A. Ishcherikova, and N. P. Drozdov.
roliznaya i Lesokhimicheskaya Promyshlen- t, No. 6, p 27-28, 1975. 2 ref, 4 tab.

scriptors: *Waste water treatment, *Chemical stes, *Resins, *Neutralization, *Evaporation, ste treatment, Wastes, Industrial wastes, ter pollution sources, Water pollution treat- nt, Water pollution control, Calcium hydrox- Resins, Hydrogen ion concentration, Water ification, Coagulation, Biological treatment, mical precipitation, Sodium compounds.
ntifiers: Rosin, Sodium hydroxide, Sodium car- ate, Calcium oxide, Calcium hydroxide, Alu- um sulfate, Iron sulfate, Oleoresins, Turpen- , Phosphoric acid.

rosin-producing factories, smelted oleoresin g with turpentine, phosphoric acid, and water rs from the smelter to a decanter, where the mixture separates into two layers. The lower aqueous layer (effluent), containing resin, phosphoric acid, and oxidation products of rosin and turpentine, is settled in a separator. The resin separated is recycled, the precipitate formed is disposed of, and the aqueous layer is purified biologically. Frequently the aqueous layer has a high content of resin making it unsuitable for biochemical purification. A study was conducted to determine means of purifying the effluent from the decanter through neutralization and evaporation. Neutralization to a pH of 7-8 was done with NaOH, soda ash, milk of lime, and powdered calciumoxide. Evaporation was conducted until 90-95% effluent was distilled. Neutralization gave a 90-97% removal of resin, the best results being obtained with powdered calcium oxide. No additional purification was obtained by treatment of the neutralized effluent with coagulants, such as aluminum or iron sulfate. Evaporation gave a residue containing the bulk of organic substances, making the distillate suitable for biochemical purification. Either method can be recommended. In the neutralization method, the precipitate can be separated either on vacuum filters or by 24-hr sedimentation. The consumpTion of calcium oxide is 21 kg/cu m of effluent. (Stapinski-IPC)
W76-05735

BIOLOGICAL TREATMENT OF DYES,
Crompton and Knowles Corp., Worcester, Mass.
R. H. Horning.
In: Book of Papers (Proceedings) National Technical Conference AATCC (American Association of Textile Chemists and Colorists), Oct. 15-17, 1975, Chicago, Illinois, p 354-358. 1 fig, 3 ref, 5 tab.

Descriptors: *Activated sludge, *Dyes, *Waste water treatment, Biological treatment, Color, Biochemical oxygen demand, Nitrification, Fish, Toxicity, Waste treatment, Water pollution sources, Wastes, Industrial wastes, Water pollution treatment, Water pollution control, Chemical wastes.

Of several dyes introduced into an activated sludge pilot plant, none interfered seriously with the BOD-reducing performance of the units, although several interfered with nitrification. Percentage color removal for 7 of the compounds exceeded 70%, but effluent color was reduced to less than 200 ADMI units for only three of the dyes. Fish toxicity of 6 dyes was substantially reduced by the bio-oxidation treatment. (Brown-IPC)
W76-05737

TREATMENT OF DYE WASTES WITH GRANULAR ACTIVATED CARBON,
P. B. DeJohn, and R. A. Hutchins.
In: Book of Papers (Proceedings) National Technical Conference AATCC (American Association of Textile Chemists and Colorists), Oct. 15-17, 1975, Chicago, Illinois, p 327-344. 8 fig, 15 ref, 7 tab.

Descriptors: *Activated carbon, *Dyes, *Textiles, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Color, Lignite, Sorption, Waste treatment, Water quality control, Water purification, Chemical wastes.

Studies on the decoloring of textile dyeing effluents indicated that granular activated carbon (GAC) can sorb much of the colorants. High-molecular dyes are adsorbed in the transitional pores, low-molecular compounds in the micropores of GAC preparations. Surface areas in micropores are drastically reduced upon thermal regeneration of GAC. The performance of reactivated carbons in adsorbing low-molecular dyes will be much poorer than for the original GAC, but equal or superior to virgin GAC in adsorbing high-molecular dyes. The properties of GAC from lignite are much less affected by regeneration than those of GAC from bituminous coal. These parameters should be taken into account in designing effluent-treating facilities. (Brown-IPC)
W76-05738

REHABILITATING AN 80-YEAR OLD SEWER SYSTEM,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
M. E. Stein, A. Alfaro, J. M. Grgin, and J. V. Artale.
Public Works, Vol. 106, No. 12, p 61-62, December, 1975.

Descriptors: *Sewers, *Sewerage, Repairing, *Waste water treatment, *Sewage treatment, *Treatment facilities, Construction costs, Legislation, New York.
Identifiers: Rehabilitation, Storm sewers.

The City of Albany, New York, began rehabilitating its 80-year old sewer system in 1966 by forming the Albany County Sewer District which then purchased the existing treatment plant from the city. The plan was to replace the treatment plant with a new secondary waste water treatment plant and maintain the Hudson River Interceptor with 18 existing and three new sewage flow regulators. Finally, the City of Albany would separate its combined sewers of two districts. The rehabilitation program ran into problems. The existing regulators were inoperative out-of-date, and difficult to reach under city streets. During the installation of new equipment, old sewer lines could not be found, and when they were, they were found to be broken or incomplete. Redesigning storm sewers to eliminate street and basement flooding could not be paid for by the existing construction grants. Although the city did benefit by an exceptionally low bid for the first sewer district project, the estimated total cost to the city, minus grant funds, still amounted to $14.5 million. In addition, from 1970 to 1975, the percentage of tax exempt properties rose from 48% to 68%. It was recommended in this report that this type of problem, which could be repeated throughout the country, be corrected by legislation. (Loustau-FIRL)
W76-05764

PLASTIC PIPE, PRESSURE SEWERS, MARK EXPANSION,
Williams and Works, Grand Rapids, Mich.
T. C. Williams.
Water and Wastes Engineering, Vol. 12, No. 11, p 85-87, November, 1975.

Descriptors: *Sewerage, *Plastic pipes, *Waste water treatment, Pipelines, Installation, Michigan, Treatment facilities.
Identifiers: *Polyethylene pipes, *Pressure sewers.

Innovative use of polyethylene pipe and installation of grinder pumps and pressure sewers marked the expansion that doubled the treatment capacity of the lagoon and irrigation system in Harbor Springs, Michigan. This is the first known use of polyethylene pipe for a collection system and the first use of grinder pumps and pressure sewers in a collection system in the state of Michigan. To serve a resort area, flexibility of operation was necessary to cope with population fluctuations, and scenic qualities of the area had to be protected. The project eliminates discharge of septic tank and treatment plant effluent into several lakes and streams in the area. (Loustau-FIRL)
W76-05765

WATER PURIFIED BY ELECTROFLOTATION FOR RAPID SEDIMENTATION AND CLEAN CLARIFIED WATER.
French Patent FR 2256-903. Issued September 5, 1975. Derwent French Patents Abstracts, Vol. W, No. 43, p D3, December 2, 1975.

Descriptors: *Patents, *Electrolysis, *Waste water treatment, *Bubbles, Treatment facilities, Equipment, Cathodes, Anodes, Flocculation, Sedimentation.

Identifiers: *Electroflotation, Physico-chemical treatment.

A newly patented electroflotation process for treating waste water consists of passing it through an electroflotation station where small bubbles of 02 and H2 are produced electrolytically. As these bubbles rise they trap solids held in suspension or in emulsion. Large solid particles should be broken up before treatment. Chemical flocculants may also be added during electrolysis. Another type of equipment for this process is one in which the electroflotation station has one or more electrolysis grids, each with several spaced-apart anodes and cathodes. The latter process provides rapid sedimentation and is applicable to waters, such as those containing detergents, which are not easily purified by strictly biological methods. (Kramer-FIRL)
W76-05766

FLOTATION PROCESS AND APPARATUS.
Australian Patent 466,009. Issued October 16, 1975. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 45, No. 38, p 4251, October, 1975.

Descriptors: *Waste water treatment, *Patents, Equipment, Oxygen, Bubbles, Liquid wastes, *Flotation, Gases, Separation techniques.
Identifiers: Oxygen-free gas, Oxygen-bearing liquids.

A process for the simultaneous separation of insoluble materials and oxygen from a contaminated oxygen-bearing liquid has been patented. A constantly changing body of contaminated oxygen-bearing liquid is established at a predetermined level and maintained in an enclosed tank. An overlying freeboard space is also established and is closed to the atmosphere. A substantially oxygen-free gas is continuously introduced into the freeboard space. Draft means extend downwardly from the free board space into the liquid body. The oxygen-free gas is drawn by way of the draft means into the liquid where it is dispersed. The gas bubbles through the liquid floating contaminants to the surface of the liquid while also displacing oxygen from the liquid. The floated contaminants and some of the displaced oxygen are discharged from the freeboard space. The residual treated liquid is also discharged. (Orr-FIRL)
W76-05767

BROOKLYN PLANT MEETS MAJOR CHALLENGES,
Hazen and Sawyer, New York.
C. R. Walter, and J. Lastihenos.
Water and Wastes Engineering, Vol. 12, No. 11, p 30-32, November, 1975. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Biochemical oxygen demand, Suspended solids, Costs, Construction, New York.
Identifiers: Renovation.

The expansion of the Brooklyn, New York, 26th Ward Water Pollution Control Plant presented the challenges of limited site, close proximity to residences, and a short schedule. The purpose of the project was to increase the capacity of the existing plant from 60 to 85 mgd, and to increase BOD and suspended solids removal from 60% to greater than 90%. At the same time the plant was modernized, repaired, renovated, and, for systems that needed it, replaced. The total cost of the plant was approximately $43 million. The chief features of the modernization and expansion of the plant were a new screen building, new raw sewage pumps, the demolition of grit chambers, and the conversion of an area into a service and storage building. Scheduling and cooperation among all contractors was extremely important under the conditions of this particular job. (Loustau-FIRL)
W76-05768

AWT PLANT IS TOP PERFORMER,
Metcalf and Eddy, Inc., Boston, Mass.
W. A. Peterson, and B. J. Sloan.
Water and Wastes Engineering, Vol. 12, No. 11, p 49-51, November, 1975. 1 fig, 3 tab.

Descriptors: *Waste water treatment, *Chemical precipitation, *Tertiary treatment, *Aeration, Aluminum, Phosphorus, Nutrient removal, Eutrophication, Sludge disposal, Construction, Costs, *Treatment facilities, Massachusetts.

The new Marlborough, Massachusetts, Easterly Advanced Wastewater Treatment Plant upgrades the quality of the effluent discharged to the Sudbury River. In the past, major water problems were excessive levels of duckweed and algal blooms due to the high phosphorus content of the effluent. The new facility removes phosphorus by chemical precipitation with alum added in the first stage aeration tank effluent channel. Studies indicated that with an aluminum to inorganic phosphorus ratio of 2.1 to one, a mean final effluent total phosphorus concentration of 0.36 results. The corresponding orthophosphorous concentration was 0.11 mg/liter and the total phosphorous removal efficiency was 94%. Total nitrogen removal through the plant was typically found to be 45%. The unit operations of the plant include comminution, grit removal, primary settling, two-stage activated sludge, chemical precipitation of phosphorous, chlorine disinfection, reaeration, and vacuum filtration with sludge disposal to an on-site sanitary landfill. The total cost of the construction of the facility was $6.2 million and the operating cost is 34 cents/1,000 gallons treated. (Loustau-FIRL)
W76-05769

PLANT PROTECTS A RECREATIONAL LAKE,
Alley (E. Roberts) and Associates, Brentwood, Tenn.
E. R. Alley.
Water and Wastes Engineering, Vol. 12, No. 11, p 69-71, November, 1975. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, Tennessee, Construction, Sewerage, Biochemical oxygen demand, Ammonia, Eutrophication, Lakes, Recreation.

When the Radnor, Tennessee, Water District's Hurricane Creek Wastewater Treatment Plant was to be expanded from 175,000 gpd to 875,000 gpd, the State Department of Public Health established strict criteria to protect the eutrophying Percy Priest Reservoir. In addition, the existing plant had to remain in service during construction, the expansion contract had to be awarded to a contractor within three months of the beginning of design, and since the project was being financed by an industrial park, the construction cost had to fall within a strict budget. To meet the tight design and approval schedule, final plans and specifications were produced within six weeks, advertisement for bids lasted 30 days, and final award was given within three months. Final plans on portions of the project were drawn while preliminary approvals were being obtained on others. Fewer change orders were needed and the final cost was lower than the bid. Since January, 1975, the average effluent BOD has been 3.2 mg/liter; the effluent suspended solids, 8.7 mg/liter; and the effluent ammonia, 0.6 mg/liter, all well within the limits. The NH3-N has been consistently reduced to 0.5 mg/liter when the influent TKN has ranged from 20 to 34 mg/liter. The total construction cost for the plant was $786,000. (Loustau-FIRL)
W76-05770

REGIONAL PLANT TREATS SEPTIC WASTES,
Boyle Engineering, Ventura, Calif.
Y. Katsura.
Water and Wastes Engineering, Vol. 12, No. 11, p 81-82, 84, November, 1975. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Septic tanks, *Municipal wastes, *Treatment facilities, Chlorine, Liquid wastes, Costs, California.

The disposal of septic tank/cesspool and chemical toilet wastes had become critical in the area of Ventura, California, due to the inability of many local waste water treatment facilities to accept those wastes and the continued disposal of the wastes on fields and ravines. The chlorine stabilization process was selected for treatment of the wastes because of its ability to achieve liquid/solid separation along with stabilization. After concentration and separation, the solid fraction is trucked to landfill and the liquid fraction is piped to the ocean. The liquid waste processing capacity of the facility is 65,000 gpd. The process consists of a receiving station and wet well, a transfer station, a degritter, a solids balancing/storage tank, solids feed pumps, solids conditioning units, solids concentration and decant storage ponds, an effluent pump station, a decant neutralization facility, and appurtenant support facilities. To stabilize the liquid waste, several factors had to be balanced, including chlorine dosage and percent solids of feed. The next critical step was solids concentration for which a unique decanting method produced a solids concentration of 17.8%. The total cost of the facility was $950,000, of which about 87% was paid for by federal and state grants. (Loustau-FIRL)
W76-05771

SUPERNATANT DOESN'T HAVE TO RUIN EFFLUENT QUALITY,
Jones and Henry Engineers, Ltd., Toledo, Ohio.
F. F. Sampayo.
The American City and County, Vol. 90, No. 11, p 52-53, November, 1975. 1 tab.

Descriptors: *Waste water treatment, *Activated sludge, *Odor, Biochemical oxygen demand, Costs, Effluents, Filtration, Suspended solids, Michigan.
Identifiers: Ammonia stripping, *Supernatants.

In order to produce high-quality effluents, a new method for treatment of supernatant and filtrate is being tried in Pontiac, Michigan. The process strips ammonia under high temperature and pH conditions while minimizing chemical requirements and unpleasant odors of ammonia. By this process BOD and suspended solids loading on the plant processes are also reduced. The ammonia stripping tank is a 12-ft diameter, 18.5-ft high fiberglass tank equipped with a bottom air header and diffusers. The tank is totally enclosed to eliminate stray ammonia odors. The process should reduce the NH3-N concentration in the recycle streams to 100 mg/liter or less, as well as remove substantial amounts of BOD and suspended solids. Air requirements for the activated sludge process can be reduced and a more stable plant operation is possible. The cost for power for stripping the ammonia is minimal. (Loustau-FIRL)
W76-05772

MUNICIPAL WASTEWATER ODOR STILL A PROBLEM--PART I,
Pennsylvania State Univ., University Park.
W. J. Hartman, and D. A. Long.
Water and Sewage Works, Vol. 122, No. 12, p 38-41, December, 1975. 2 fig.

Descriptors: *Odor, *Municipal wastes, *Waste water treatment, Waste water disposal, Air pollution, Anaerobic treatment, Industrial wastes, Algae.

Odors associated with collection, transport, treatment, and disposal of sludge and waste water effluents are a form of air pollution related to municipal waste water treatment. Odors can come from the vapors and gasses produced by the anaerobic decomposition of compounds, or they

n be the result of chemicals in industrial waste. lgae, an important waste stabilizer, can also be a urce of odors. Preventing water from stagnating d skimming algal overgrowth are two solutions the problem. Careful separation of solids is nother minimizing solution. Two other problems lated with municipal waste water, insect breed- g and pathogen dissemination, are also scussed. (Loustau-FIRL)
76-05773

ND AND IRRIGATION SYSTEMS OFFER CONOMY AND FLEXIBILITY,
illiam and Works, Grand Rapids, Mich.
C. Williams.
ater and Sewage Works, Vol. 122, No. 12, p 44- , December, 1975.

escriptors: *Oxidation lagoons, *Waste water eatment, *Irrigation, Waste water disposal, Crop oduction, Capital costs, Economics.
entifiers: Oxidation ponds, Spray irrigation.

idation pond and irrigation waste water stems, especially suited for small communities, e 'natural' systems requiring little maintenance. e oxidation ponds or stabilization lagoons need be checked once a day. The irrigation system is ually one of three systems: spray, flood, or ridge d furrow. The spray system with center pivot uipment is the most widely used in the United ates. Crops ranging from alfalfa to Christmas es are often grown in conjunction with the ir- ation system. An especially attractive feature of nd and irrigation systems is that they can be veloped in stages with low initial costs. oustau-FIRL)
76-05774

OSPHORUS REMOVAL FROM STATIC WAGE EFFLUENT USING DUCKWEED,
ricultural Research Center, Fort Lauderdale,
L. Sutton, and W. H. Ornes.
rnal of Environmental Quality, Vol. 4, No. 3, p -370, September, 1975. 4 fig, 1 tab, 12 ref.

escriptors: *Sewage effluents, *Nutrient moval, *Waste water treatment, Phosphorus, fluents, Aquatic plant, Tertiary treatment, ewage treatment.
ntifiers: *Duckweed, *Phosphorus removal.

uatic macrophytes have been used to remove rients from sewage effluents. In this case, ckweed (Lemnaceae family) was suggested for removal of phosphorus and experiments were nducted to determine the amount of plant terial and length of time necessary to reduce the rient level in enriched water. The level of duction of plants that could be expected when nt are harvested was also investigated. A mixed ulation of duckweed was grown for two weeks 2 liters of 16, 12, and 25% concentrations of ondary treated sewage effluent; the dry ghts of these plants were 16, 23, and 31% ner than plants grown in pond water. Over 90% the phosphorus in the sewage effluent was oved by the duckweed during the first four ks of an eight week period; during the second r weeks removal was slow. For the whole od, the phosphorus content of the sewage ef- nt was reduced from 2.67 to 0.08 micro- ns/ml, a 97% decrease. The conclusions of the ly were that duckweed could be used to reduce ls of phosphorus in sewage effluent held under ic conditions. The removal rate depend upon amount of duckweed, concentration of sphorus in the effluents, and length of contact e. (Kramer-FIRL)
5-05775

OCESS BIODEGRADABLE EFFLUENT UN- RGROUND.
essing, p 33, September 1975. 2 fig.

Descriptors: *Biological treatment, *Waste water treatment, *Aeration, Activated sludge, Biodegradation, Costs, Environmental effects.
Identifiers: *Deep shaft aeration process.

One of the few 'spin-off' technique effluent treatment operations is the ICI Deep Shaft Aeration Process at Billingham. The process is a combination of activated-sludge and aerobic-digestion systems located in a mined shaft hundreds of feet deep. Because of the pressure resulting from the great depth of the shaft the air bubbles disappear before reaching the bottom of the shaft, and all the dissolved oxygen is available to the process, thus reducing the normal retention time from 12 hours to 2 hours. The biodegradable effluent and microorganisms are circulated by compressed air until the biological oxidation is complete, when it overflows by gravity for solids separation. Some of the advantages over conventional systems are 50% land saving due to eliminated settling stage, 50% less sludge production, low capital and operating costs and minimal environmental impact. (Loustau-FIRL)
W76-05776

WASTEWATER RENOVATION AND REUSE:AN URGENT ENVIRONMENTAL NEED,
F. D'Itri.
Compost Science, Vol. 16, No. 5, p 26-27, Autumn, 1975.

Descriptors: *Waste water treatment, *Recycling, *Water reuse, Industrial wastes, Sludge disposal, Conferences, Waste water disposal.

Thirteen recommendations were made by the International Conference on the Renovation and Recycling of Wastewater Through Aquatic and Terrestrial Systems. The representative scientists from nine countries at the July, 1975, meeting exchange information on reuse technology, discussed the possibilities of use of waste water, and examined the social impacts of waste water reuse in various countries. They then drew up the program of recommendations which included the demand for all varieties of industrial waste, the recommendation that no sludge be used resulting in direct human consumption, and the request that detailed consideration be given to the actions of heavy metals, biocides, teratogens, carcinogens, mutagens, and all varieties of pathogens. (Loustau-FIRL)
W76-05777

MUNICIPAL PLANT HANDLES 44% PULP AND PAPER MILL WASTES,
H. G. Swope.
Water and Sewage Works, Vol. 122, No. 12, p 61, December, 1975.

Descriptors: *Pulp wastes, *Sewage treatment, *Municipal wastes, Pulp and paper industry, Wisconsin, *Treatment facilities, Operating costs, Incineration, Biological treatment.
Identifiers: *Municipal-industrial wastes, Joint treatment.

The Green Bay Sewage Treatment Plant is the first plant in Wisconsin that handles municipal sewage containing 44% pulp and paper mill wastes. The plant, which represents a partnership of public and private sector was designed to meet the districts projected waste water treatment needs until at least 1990. The operating costs of the facility will be $1 million annually. The sewage at the Green Bay plant undergoes mechanical treatment, biological treatment, and solids processing. The sludge is incinerated and the ash deposited as landfill. As of the end of 1975, part of the facility was still under construction. The project was expected to cost approximately $72 million and was designed to handle a peak flow of 171 mgd. (Loustau-FIRL)
W76-05778

TORONTO'S APPROACH TO PREVENTIVE MAINTENANCE FOR TREATMENT PLANTS,
Metropolitan Toronto Dept. of Works (Ontario). Water Pollution Control Div.
For primary bibliographic entry see Field 5F.
W76-05780

OPERATIONAL PRACTICES TO UPGRADE TRICKLING FILTER PLANT PERFORMANCE,
Henningson, Durham and Richardson, Inc., Omaha, Nebr.
L. E. Shriver, and D. M. Bowers.
Journal Water Pollution Control Federation, Vol. 47, No. 11, p 2640-2651, November, 1975. 9 fig, 2 tab, 9 ref.

Descriptors: *Trickling filters, *Waste water treatment, Biological treatment, Clarification, Coagulation, Treatment facilities, Filtration.
Identifiers: Alum, Chemical treatment.

An investigation of trickling filter plant performance was conducted to discover the reasons for clarifier inefficiencies in winter and to find ways to improve effluent quality in winter. Samples of final effluent were tested and chemical coagulation was done by jar tests at typical wintertime temperatures. Of the various chemical coagulants tested, detailed reports on the coagulant alum were made because of reports of success at many treatment plants. It was found that the terminal settling velocity of a particle with a given size and density decreases with a decrease in temperature. Adding alum to the trickling filter effluent upgraded plant performance and increased sludge volumes, but digester operation must be watched more closely. Several recommendations for improving plant operation in winter were made. Waste water temperature variations should be considered in final clarifier surface loading design. When adding chemicals, mixing, recirculation flows, freezing, and corrosion are important considerations. Separate chemical treatment for digester supernatant and/or high-strength in-plant waste streams should be considered at plants in which the impact of this waste is significant. (Loustau-FIRL)
W76-05781

ANAEROBIC DIGESTION: THE RATE-LIMITING PROCESS AND THE NATURE OF INHIBITION,
Drake Univ., Des Moines, Iowa. Dept. of Physics.
C. D. Finney, and R. S. Evans.
Science, Vol. 190, No. 4219, p 1088-1089, December 12, 1975. 1 fig, 1 tab, 21 ref.

Descriptors: *Anaerobic digestion, *Waste water treatment, *Bacteria, Methane, Carbon dioxide, Kinetics, Design criteria, *Inhibition.

Anaerobic digestion would hold much greater promise if faster processes could be developed. One hypothesis is that the transfer of acetic acids by methanogenic bacteria into methane and carbon dioxide gases is rate-limiting, and that the normal metabolic activity of the methanogenic bacteria is inhibited by product gases. It is possible that at very high substrate concentrations gas bubbles actually surround a bacterium, interfering with substrate diffusion into intracellular spaces. An experiment for determining the kinetic parameters of the methanogenic bacteria in a highly mixed, low-pressure environment, resulted in improved gas transfer characteristics in the region of the bacterial cell wall. The indication is that faster, more efficient anaerobic digesters might be developed. Design specifications for faster systems might include vigorous agitation, low pressure, and elevated temperatures. (Loustau-FIRL)
W76-05784

LIME RECOVERY AND REUSE IN PRIMARY TREATMENT,
Brown and Caldwell, Walnut Creek, Calif.

D. S. Parker, G. A. Carthew, and G. A. Horstkotte.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 101, No. EE6, p 985-1004, December, 1975. 8 fig, 7 tab, 7 ref.

Descriptors: *Waste water treatment, *Lime, *Recycling, California, *Water reuse, Monitoring, Design, Sampling, Treatment facilities, *Water treatment.
Identifiers: Unit processes.

The lime recovery and reuse study, part of the research undertaken by the Central Contra Costa Sanitary District of California, was conducted in order to provide design and operating data on the various unit processes being designed for the district's new water reclamation plant. The study investigated the solids processing and recycling operations and monitored the performance and interaction of the individual unit processes under recycle conditions. Sampling and analysis of the constituents of each stage of the solids processing system allowed determination of amounts of calcium, magnesium, phosphorus, iron, silica, available lime, total solids, and loss on ignition. Daily logs were devised so that, along with laboratory data, calculations could determine the performance of the recycle process. It was found from the investigation that recalcined lime performed better than the virgin lime in primary treatment applications. Calcium carbonate and, to a greater extent silica, are classified into the cake in the wet classification process. Recalcination efficiency was dependent on recalcination temperature. A rejection of 24% of the silica, while recovering 98% of the calcium oxide, is possible in the dry classification process. Mass balances for the full-scale system indicate that 62% recycle of lime is possible while keeping recycled solid loads at reasonable levels. (Loustau-FIRL)
W76-05785

LOW COST PHOSPHOROUS REMOVAL,
L. E. Peirano.
Water and Sewage Works, Vol. 122, No. 11, p 58-59, November, 1975.

Descriptors: *Activated sludge, *Chemical precipitation, *Waste water treatment, Nutrient removal, Phosphorus, Equipment, Costs, Biological treatment, Nevada, *Operating costs.
Identifiers: *PhoStrip process, *Phosphorus removal.

The PhoStrip process was studied in a plant-scale test at the Reno-Sparks Joint Water Pollution Control Plant that treats approximately 6 mgd of domestic waste water. The PhoStrip process utilizes activated sludge microorganisms to concentrate phosphorous from the waste water flow stream into a smaller stream from which the phosphorous is removed by chemical precipitation. The major difference between the PhoStrip process and other biological processes for phosphorous removal is the use of a separate phosphorous stripping tank where phosphorous release is induced and controlled. An equation for phosphorous removal efficiency is given as E = 100 - 130 to the (1.85-P) power, where E stands for phosphorous efficiency and P stands for a composite parameter. During the study it was noted that the PhoStrip process produced more stable sludge than conventional systems, and that it had no significant effects on BOD or suspended solids removal or on aeration air requirements. The PhoStrip was also less affected by shock loads because of the offstream reservoir of activated sludge provided by the stripping tank. The system did produce more froth than the conventional system, and some odor emanated from the stripping tank. The PhoStrip process achieved greater than 90% removal of phosphorous, and at the Reno-Sparks plant will save an estimated $600,000 to $800,000 annually in operation and maintenance costs. (Loustau-FIRL)
W76-05786

COMBINED WASTE TREATMENT PROVES ECONOMICAL AND FEASIBLE,
Whitman and Howard, Inc., Boston, Mass.
J. T. Hannigan.
Water and Sewage Works, Vol. 122, No. 11, p 38-41, November, 1975. 1 fig, 3 tab.

Descriptors: *Pilot plants, *Food processing industry, *Waste water treatment, Municipal wastes, Tertiary treatment, Treatment facilities, Biochemical oxygen demand, Massachusetts, Economics, Feasibility.
Identifiers: Municipal-industrial wastes, *Combined treatment.

Results of a pilot plant study have shown that combined treatment of domestic waste and industrial cranberry waste is the most economical way to treat both waste waters in the town of Middleborough, Massachusetts. The municipal plant presently treats the cranberry industry's waste, but due to plant expansion, population growth, and equipment wear, a new treatment facility is necessary. The study showed that the cost of constructing a tertiary treatment facility to handle both domestic and industrial cranberry waste is almost 1.5 million dollars less than the cost of a tertiary treatment facility for the domestic waste water alone. The results of the study also showed that the cranberry waste is substantially biodegradable and the mixture of both domestic and industrial resulted in the BOD rate constant approaching that of the cranberry facility's waste water alone. Biological treatment of the combined wastes, in which the domestic wastes will take advantage of the nutrient deficiencies of the industrial waste, should achieve excellent BOD removal as well as a reduction in the overall phosphorus and ammonia nitrogen concentration. The proposed facility will include a pretreatment facility, two primary clarifiers, four aeration tanks, two secondary clarifiers, a post chlorination detention tank, a sludge handling and chlorination building, a sludge holding tank, a new control building, two rapid sand filters and a post aeration tank. Construction of the project, estimated to cost $4.5 million, began in 1975 and is projected to be completed in 1977. (Loustau-FIRL)
W76-05787

CROSS-FLOW FILTRATION AND AXIAL FILTRATION,
Oak Ridge National Lab., Tenn.
K. A. Kraus.
In: Proceedings of the 29th Industrial Waste Conference, Part Two, May 7-9, 1974, Lafayette, Indiana, Purdue University, p 1059-1075. 13 fig, 3 tab, 34 ref.

Descriptors: *Filters, *Filtration, *Waste water treatment, Effluents, Colloids, Design, Equipment, Analytical techniques, Separation techniques, Centrifugation, Energy, Economics.
Identifiers: *Axial filtration, *Cross flow filtration, Particulate matter, Flux decline.

Increasing effluent standards are making presently adequate treatment methods unsatisfactory. Alternative, more efficient solid-liquid separation techniques are needed. Two novel forms of filtration, cross-flow filtration and axial filtration, are discussed. Cross-flow filtration is the technique whereby the feed solution is rapidly pumped past the filtering solution at right angles to product flow. Cross flow filtration is carried out at low pressures and deals with the removal of particulates and colloids, and so must be differentiated from hyperfiltration and ultrafiltration. Axial filtration depends on the idea that pumping a solution past a filter is no different from passing a filter through a solution. The filter rotates about a hollow cylinder and, at high rotational velocities, filtration is augmented by high centrifugal forces. Various design options for the two types of filter are discussed. Axial filters can be used in different modes of operation, depending on the rotational velocities. The object of both types of filtration is to produce flow speeds such that the flux declin as a function of time is arrested. A mathematic analysis of flux decline is presented. An econom cal analysis of the filters is given. For cross-flo filters, energy requirements per unit product a inversely proportional to production rate for constant cross-flow velocity. For a constant ene gy consumption, cross-flow velocities increa with production rate. Axial filters can becom uneconomical when dealing with extremely sma particles, since very high rotational speeds a required to arrest flux decline. Various applic tions of these designs are illustrated. (Pinto-FIRL
W76-05788

TERTIARY TREATMENT PLANT FO MULTISTORIED BUILDING,
Dorr-Oliver (India) Ltd., Madras.
K. N. Savalappan.
Journal of the Institution of Engineering (India Vol. 55, Part PH3, p 81-84, June, 1975. 1 fig, 2 tab

Descriptors: *Treatment facilities, *Tertiary trea ment, *Waste water treatment, Activated sludg Sewage, Aeration, Effluents, Buildings, Wat reuse, Biochemical oxygen demand, Separati techniques, Costs.
Identifiers: Multistoried buildings, Bo bay(India), *India.

Modern technology has resulted in large conce trations of people in India and, consequently, increase in the number of multistoried building Bombay, which contains many of these building has an acute water scarcity. Tertiary treatme which makes sewage fit for reuse, is discussed as technique to increase the water supply f multistoried buildings. Water is lost throu domestic use and, although water used for air co ditioning units can be reused after cooling, a ce tain amount is lost through evaporation. Tertia treatment plants were installed to make toil water fit for reuse as cooling water in air con tioning units. A flow sheet of a tertiary treatme plant is illustrated. Sewage is brought from t building and large floating matter is filtered with bar screen. The activated sludge process is used the aeration tanks to purify the raw sewage. T biochemical oxygen demand of the effluent fro this tank is monitored. The aerated sewage flo into a clarifier where the biological solids a separated and returned to the aerator. Coagulan are added and the effluent is flocculated a further clarified. The effluent undergoes rap sand gravity filtration and is softened in regeneration unit by means of a cation exchan process. The final step is chlorination, to preve algal growth. Costs may vary over a considerab range, but the apparatus, methods and process exist to produce water of virtually any puri required. (Pinto-FIRL)
W76-05789

CONVERTING SEWAGE INTO SAVINGS.
Chemical Week, Vol. 118, No. 2, p 47, January 1976.

Descriptors: *Tertiary treatment, *Operati costs, *Recycling, Ammonia, Fertilizers, Trea ment facilities, *Waste water treatment, *Sewa treatment, California, Nevada.
Identifiers: *Ammonium sulfate fertilizer, Clino tilolite, *Ammonia removal and recove process(ARPP), Lake Tahoe(Nevada-Calif)

Producing ammonium sulfate fertilizer will he defray the operating costs of a new tertiary trea ment plant being built on Lake Tahoe. The a monia removal and recovery process produc 40% concentration ammonium sulfate soluti from the regeneration stream from the plant's a monia-stripping ion-exchange beds. The soluti contains about 9% available nitrogen, suitable f direct irrigation of sprinkler system application farmers or for blending by commercial fertiliz manufacturers into ammonium sulfate. The Nor

ake Tahoe plant will produce between 2.5 and 5 ons of fertilizer per day. The cost of installing the rocess is about 10% of the total construction cost f the new plant, but the designers say the sale of rtilizer materials will cut operating expenses by 0%. Ammonia is removed from the waste stream y passing over a bed of clinoptilolite. The bed is ien flushed with a concentrated sodium chloride olution which 'bumps' the ammonia ions into a egeneration solution. With an ammonium concenation of about 300 ppm, the solution is pumped to clarifiers where sodium hydroxide is added to onvert the ammonium ions into ammonia gas. In absorption tower the gas is converted into a 0% solution of ammonium sulfate. The ammonia moval and recovery process is part of a $20 milon waste treatment system that includes pure-oxgen-activated sludge treatment, two-stage lime dition for the removal of phosphorus, dualedia filtration, activated carbon adsorption, ionxchange for ammonia removal, and chlorination r disinfection. (Loustau-FIRL)
76-05790

IOLOGICAL DENITRIFICATION AND ITS PPLICATION IN TREATMENT OF HIGH-ITRATE WASTE WATER,
ak Ridge National Lab., Tenn. Environmental iences Div.
. W. Francis, and M. W. Callahan.
ournal of Environmental Quality, Vol. 4, No. 2, p 3-163, April/June, 1975. 2 fig, 1 tab, 82 ref.

escriptors: *Denitrification, *Biological treatent, *Anaerobic conditions, Activated sludge, Nitrates, Industrial wastes, Fertilizer, *Waste ater treatment, Cations.

ne of the most effective denitrification processes biological denitrification in which nitrates are onverted to nitrogen by microorganisms respiring nder anaerobic conditions. The optimum condions for maximum denitrification include a ydrocarbon for additional cell synthesis, a pH in e range of 7.5 to 8.5, and a temperature range of to 60 C. The modified activated sludge reactor one basic design that has been developed and sted for denitrification. In this system long redence times are required to prevent loss of icrobial mass through washout. Another design, e packed-bed reactor, provides surface area for icrobial growth which reduces washout and ineases cell concentration. When large flow rates e required, biomass accumulation in the bed ineases head loss, and then maintaining a pumping stem becomes a problem. Large head losses are even greater problem in anaerobic columns in hich the flow is operated in a downward mode. lthough upward flow columns resemble packedd reactors, they contain a much lower pore ace than the packed-bed reactor. The engineerg design used for biological denitrification of trate wastes will depend on the dominant comementary and associated cations in the waste. naerobic columns appear to be the most effece method for the treatment of nitrate wastes asciated with fertilizer and uranium oxide fuel rication plants. (Loustau-FIRL)
76-05792

JEBEC'S WATER AND SEWAGE MASTER-AN FOR MIRABEL REGION.
ater and Pollution Control, Vol. 113, No. 12, p , December, 1975. 1 fig.

scriptors: *Water pollution control, *Waste ter treatment, *Sewage treatment, Treatment ilities, *Airports, Costs, Administration, egional development, Canada, Comprehensive nning.
ntifiers: Quebec, *Montreal(Mirabel Int'l Airrt).

cause it is predicted that the population around ntreal's Mirabel International Airport will tri within the next 25 years, a masterplan for water distribution and treatment in the area surrounding the airport has been drawn up and released. The plan divides the area into three regions and advises expansion of some existing facilities and construction of some new facilities. Federal and provincial authorities will provide the funding for each municipality, but there is no pressure to comply with the masterplan. The only part presently under construction is the sewage treatment plant for the airport and the adjacent industrial park, but its facilities will not be used by the municipalities. The total projected construction costs for the regional distribution and treatment plants is approximately $114 million. (Loustau-FIRL)
W76-05793

EDINBURGH'S SEWAGE-TREATMENT AND DISPOSAL SCHEME,
Edinburgh Corp., (Scotland).
J. Dugdale.
Water Pollution Control, Vol. 74, No. 6, p 611-624, 1975. 9 fig, 1 ref.

Descriptors: *Sewage disposal, *Waste water treatment, Construction, *Treatment facilities, *Outfalls, Sewerage, Construction, Waste water disposal, Waste disposal.
Identifiers: *Scotland(Edinburgh).

Because of the recent emphasis on improvement of sewage disposal methods, a scheme for improvement of existing facilities was presented to the City of Edinburgh. A number of the aspects of the scheme were investigated and then final approval was given to the scheme in the beginning of 1971. Construction should be completed by the middle of 1976. The existing sewage disposal was done via nine main outfall sewers distributed over 14 km of the city's coastline. The scheme proposed to redirect all the sewage flow to a central point in an interceptor sewer system where primary treatment would be carried out followed by discharge through a sophisticated outfall to the Estuary and disposal of sludge in the sea. The outfall area was studied for current direction and velocity over a wide range of tidal and wind conditions. The raw sludge disposal area in the sea is about 25 km offshore and a tanker for carrying the sludge is under construction. Almost half of the total 15.8 km of interceptor sewer system is already completed. The site of the sewage treatment works was chosen to be the Estuary which required land reclamation. The extent of reclamation was about 22 ha, of which 11.8 ha is for the primary treatment works, and the rest is for future expansion. The sewage treatment works include preliminary treatment, primary treatment, storm-sewage treatment, and sludge storage. The current total estimate of cost of the whole scheme is L22 million, of which almost half is for interception and redirection of sewage. A survey of the biological habitat along a 19 km length of coastline around the city is being conducted before and after operation of the new treatment scheme. (Loustau-FIRL)
W76-05794

FACTORS IN THE PURIFICATION OF FLOWING SEWAGE AND ACTIVATED SLUDGE PROCESS, PART I,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
S. C. Pillai, E. G. Srinath, C. V. Viswanathan, B. Merra Bai, and G. Kasi Viswanath.
Water and Waste Treatment, Vol. 18, No. 9, p 36, 38, 40, 42, 44, September, 1975. 18 fig, 4 tab.

Descriptors: *Activated sludge, *Sewage treatment, *Sewerage, *Protozoa, Alkalinity, Turbidity, *Waste water treatment, Water analysis, Asia, Water purification.
Identifiers: *India.

Because little is known about the purification of sewage in running water, a study was made of the sewage system of Bangalore in which waste water flows through channels to tanks 10 and 25 miles from the city. Samples of sewage were collected from the longest channel which carries daily about 14 million gallons of sewage and has a general gradient of about 1/100. The velocity of the channel water varied from 2 to 8 feet per second. Analysis of the samples of sewage that had traveled about 7 miles in 4 to 6 hours revealed that turbidity values, bacterial count, catalase activity, oxidizable organic matter, BOD, ammoniacal nitrogen, water soluble phosphorus, total phosphorus, and fatty matter had been reduced to the point at which the water could be considered purified. The alkalinity of the same sewage was not comparably reduced and the reason for this is not clear. A test was then conducted to study the influence of turbulence in the running water purification system. Hourly analyses of samples taken for 24 hours did not show any appreciable purification. A test of the growth of protozoa in raw sewage and boiled sewage showed that when protozoan growth was about 20%, purification was appreciable; when protozoan growth was less, purification was negligible. A test comparing the technique of fluidization with the activated sludge process was conducted, producing equal results. The experiments not only establish the role of protozoa in sewage purification, but also indicate the possibility of improving the activated sludge process. (Loustau-FIRL)
W76-05795

MINIMAL COST PLANT CLEANING UP HARBOR,
Albertson, Sharp and Backus, Norwalk, Conn.
E. Backus.
Water and Wastes Engineering, Vol. 13, No. 1, p 16-17, 43, January, 1976. 3 fig, 1 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, Construction, Suspended solids, Biochemical oxygen demand, Connecticut, *Operating costs.
Identifiers: Norwalk(Conn).

During the first four months of operation of the Norwalk, Connecticut, new waste water treatment plant, average removals of 90% suspended solids and 86.8% BOD5 were achieved. Secondary treatment begins as the effluent from the primary settling tanks enters the aeration tanks and flows through secondary settling tanks to a chlorine contact tank. Sludge removed from the secondary tanks is returned to the aeration tanks or wasted to a splitter box which can divide the sludge among one to three flotation thickeners. Sludge from the thickeners is concentrated in a Dorr-Oliver tray thickener, and then pumped to a group of four centrifuges. This plant varies from conventional systems in the details of construction rather than in the basic flow pattern. Each of the aeration tanks can be fed in homogeneous, step, or plug flow. The secondary settling tank overflow arrangement is a unique system of fiberglass collecting launders which may be placed anywhere in the last half of the tank where the greatest clarity is observed. An old abandoned, primary digester tank was used to house the new main electrical substation equipment. The plant is located on a 28 acre site much of which used to be flooded at high tide. The plant grade was raised to a level higher than the flood stage of the 1938 hurricane by adding 150,000 cu ft of fill. The fill was obtained from Norwalk's incinerator landfill site which needed more capacity. A stone-faced revetment, with a slope of one on eight, was constructed to retain the landfill. (Orr-FIRL)
W76-05796

AUTOMATION CAN BE SIMPLE,
R. J. Martin.
Water and Wastes Engineering, Vol. 13, No. 1, p 31, 42, January, 1976. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Automatic control, *Automation, Control systems, Instrumentation, Equipment, Sewage treatment, Costs, New York.

An automatic system based on the application of simple electro-mechanical controllers has been on stream for over three years in two waste water treatment plants in Sheburne and Alfred, New York. The system comprises an electro-mechanical controller that energizes circuits which provide automatic control for the routine operations of drawing supernatant and pumping sludge and scum. The stepping drum controller initiates a sequence of opening and closing valves, and starting and stopping pumps, heater, mixer and sludge collectors. Each step is actuated by a signal indicating that the preceding step is finished. A malfunction in any step will return all the units to the 'at rest' mode and actuate alarm lights and/or audible alarms. The drum will remain at the step on which the malfunction occurred, permitting the operator to easily determine the type of malfunction. The controller includes: a perforated aluminum drum, step-driven by an electric motor; a series of roller-lever-actuated snap-action switches; terminal strips for input and output connections; and, control circuitry for the drive motor. Points around the circumference of the drum correspond to the steps of the treatment program while points along the axis of the drum correspond to individual control outputs. The system was installed in each plant for about $25,000. (Orr-FIRL)
W76-05797

THIS PLANT CAN USE 5 SLUDGE PROCESSES,
Rist-Frost Associates, Glens Falls, N. Y. Dept. of Environmental Engineering.
M. Vonic.
Water and Wastes Engineering, Vol. 13, No. 1, p 26-28, January, 1976. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Activated sludge, *Control systems, *Treatment facilities, Flow, Temperature, Costs, New York, Suspended solids, Biochemical oxygen demand, Recreation, *Sludge treatment.

The new 2 mgd waste water treatment plant designed for the Village of Saranac Lake, New York, is capable of maintaining between 90% and 96% BOD and suspended solids removal despite substantial fluctuations in waste water flow due to a large summer tourist population. The plant can be operated with five different types of activated sludge processes which permits the operator to produce a high quality of effluent even though the flow and temperature vary considerably. During 1974, the plant operator was able to achieve a consistently high plant performance with an average of 92% BOD and suspended solids reduction, using only half of the available biological reactor capacity. The main sludge process utilized during this period was 'two stage'-'step feed.' The food to microorganism ratio (F/M) was maintained between 0.2 and 0.4; the sludge age varied between four and eight days, average age was five days. A mixture of raw and waste activated sludge is thickened in a gravity sludge thickener and then pumped to the primary heated digester. The use of a thickener has reduced the cost of heating the sludge for digestion. The total cost of the facilities was about $2 million. (Orr-FIRL)
W76-05798

AERATED LAGOONS SOLVE TOWN'S SITE PROBLEMS,
Burns and McDonnell, Kansas City, Md.
W. E. Goodnow.
Water and Wastes Engineering, Vol. 13, No. 1, p 40, January, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Aerated lagoons, *Aeration, Equipment, Cleaning, Pipes, Oxygenation, Lagoons, Missouri, Oxidation lagoons.
Identifiers: *Oxygen transfer.

Lee's Summit, Missouri, has installed two aerated lagoons at its Vale Treatment Facility. They have a combined volume of 92.8 million gal. The lagoon bottoms and dikes were constructed of compacted earth and no liners or sealer were required. The aeration system is 7,300 feet of plastic header pipe carrying air supplied by three 30-hp Roots positive displacement blowers operating simultaneously to deliver 595 cfm each of six to seven pounds pressure. 84,500 feet of Air-Aqua aeration tubing creates a pattern of 168 aeration cells. Openings in the tubing release a constant stream of small air bubbles which form linear screens dividing the lagoons into separate treatment cells, mixing the liquid contents, and efficiently transferring oxygen. Effluent dissolved oxygen measurements are consistently greater than 4 ppm. Three cleanings/year are required for the aeration system to remove the carbonate deposit buildups around the aeration tubing outlets. Anhydrous HCl gas is used for cleaning. The gas hydrolyzes into an acid upon contact with water and dissolves the deposits of calcium and magnesium carbonates. (Orr-FIRL)
W76-05799

BIOLOGICAL NITRIFICATION OF SLUDGE SUPERNATANT BY ROTATING DISKS,
Metropolitan Sanitary District of Greater Chicago, Ill. Dept. of Research and Development.
C. Lue-Hing, A. W. Obayashi, D. R. Zenz, B. Washington, and B. M. Sawyer.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 25-46, January, 1976. 11 fig, 10 tab, 9 ref.

Descriptors: *Waste water treatment, *Nitrification, *Biological treatment, Ammonia, Nitrogen, Illinois, *Sludge treatment, Denitrification.
Identifiers: *Rotating disk system, *Chicago(Ill), Ammonia nitrogen, *Sludge lagoon supernatants.

In its search to find a practical method of reducing the ammonia nitrogen content of its sludge lagoon supernatant (SLS), the Metropolitan Sanitary District of Greater Chicago (MSDGC), Illinois, evaluated the nitrification of SLS by rotating disk system (RDS). The SLS taken from the digested sludge holding basins at the District's land reclamation site in Fulton County was tested in a rotating disk pilot unit consisting of a 35 gal semicircular tank which was divided into four equal compartments and contained polyethylene disks providing 250 sq ft of total surface area. During the 47 weeks of the experiment, successful nitrification of a high-strength ammonia waste water was achieved under both ambient summer and winter conditions. At an overal ammonia nitrogen loading of 15.5 lb NH3-N/day/1000 cu ft and a waste water temperature of 10 C, 99.4% of the ammonia was removed. Increasing the loading to 43.5 lb and the temperature to 20 C, increased the ammonia removal to 99.8%. Significantly higher removal rates would be possible if uniform growth could be established over all of the disks of the four stages. Nitrifying growth must be established on the disks before the beginning of winter. The effects of clarifying the effluent and recycling the flow during winter operation in an attempt to improve nitrification efficiency were minimal. (Orr-FIRL)
W76-05800

WASTEWATER TREATMENT EVALUATION, MATHER AIR FORCE BASE, CALIFORNIA,
Environmental Health Lab., McClellan AFB, Calif.
C. F. Pauls.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A 010-872, $5.50 in paper copy, $2.25 in microfiche. June, 1974. 91 p, 5 fig, 21 tab, 13 ref.

Descriptors: *Waste water treatment, *Treatmen facilities, *Surveys, Effluents, Biochemical ox ygen demand, Water quality control, Main tenance, Equipment, California.
Identifiers: National Pollutant Discharge Elimina tion System(NPDES).

In order to apply for a discharge permit from th EPA under the terms of the National Pollutan Discharge Elimination System, a survey was con ducted of the waste water treatment facilities a Mather Air Force Base in California. The survey required samples to be taken from the effluen lines of the oil separators serving the aircraft an AGE washracks, from each of the plant units, an from the effluent sewer serving the metal cleanin and plating operation. The samples were analyze for factors including alkalinity, BOD, COD presence of solids, oil and grease, phenols, pesti cides, and phosphates. Complete lists of analyses methods, and results are given in tables. Th discharge from the treatment plant, the polishin pond, and the drainage ditch met national stan dards. The first stage of the treatment facility di not provide sufficient reduction on BOD, SS, o fecal coliform organisms to provide secondar treatment according to EPA standards. Discharg from an inoperative lift station and overflow line and underdrains from the oil separators were bot sources of uncontrolled water pollution an required modification. Suggestions were made fo improvement of the treatment facilities, of th drainage systems, and of equipment operation. I was also recommended that maintenance be im proved and a maintenance program be developed (Loustau-FIRL)
W76-05801

WASTEWATER TREATMENT EVALUATION MT. HEBO AIR FORCE STATION, OREGON,
Environmental Health Lab., McClellan AFB Calif.
C. F. Pauls.
Available from the National Technical Informa tion Service, Springfield, Va 22161 as AD-A 00 471, $5.00 in paper copy, $2.25 in microfiche February, 1975. 72 p, 6 fig, 12 tab, 8 ref.

Descriptors: *Waste water treatment, *Treatmen facilities, *Biological treatment, *Trickling filters Municipal wastes, Water quality control, Oregon Evaluation.

Samples from Mt. Hebo's site and housing are domestic waste water treatment facility wer analyzed and compared with the standards of th National Pollutant Discharge Elimination Syste issued by the EPA. Each treatment facility's per formance was compared with predicted per formance standards based on design equations o with standard practice. Results of chemical an bacteriological analyses are given in tables an discussed in detail in the article. The effluent fro the site and housing treatment facilities did no meet the national standards, so recommendation were made for improving existing facilities. Thes recommendations include repairing the secondar clarifier at the site treatment facility that was ineffective at the time of testing, modifying the con veyance system at the housing area facility, an improving the trickling filter. It was also suggeste that better maintenance and operational contro could improve plant efficiency at both locations Automated equipment for monitoring effluent i being considered for the facilities. Secondary ef fluents from the facilities can be applied to the so and infiltrated into the ground as no undesirabl affects can be foreseen. (Loustau-FIRL)
W76-05802

AN EVALUATION OF THE USE OF GAMM RADIATION IN SEWAGE TREATMENT,
Australian Atomic Energy Commission Researc Establishment, Lucas Heights.
P. A. Bonhote, J. G. Clouston, G. W. K. Ford, and N. J. Gregory.

Available from the National Technical Information Service, Springfield, Va 22161 as AAEC-E 330, $4.00 in paper copy, $2.25 in microfiche. December, 1974. 2 fig, 2 tab, 6 append.

Descriptors: *Sewage treatment, *Gamma rays, Costs, *Waste water treatment, Coliforms, Biodegradation, Australia.

A critical assessment of sewage treatment with gamma radiation was made by the Australian Atomic Energy Commission Research Establishment. The assessment was undertaken in response to a claim made by Energy Systems Incorporated of Florida that cobalt-60 irradiation was advantageous in recovering sewage water. The subject was considered for cost factor, the physical and chemical effects of radiation for purification and recovery of waste water, and for radiation effects on the microbiology of waste water. To date there is little literature indicating significant contributions to sewage recovery methods by irradiation. Statements on the lethality of irradiation to viruses are not substantially validated. Coliform count is not an indicator of effective sewage treatment and can be misleading. The irradiation dose of 100,000 rad is not adequate and a significant dose increase would be necessary. Irradiation has no significant effect on the degradation of pesticides and detergents. In sum, irradiation methods have at present no cost advantage, no proven technical advantage and no proven biological advantage over known treatment systems and may have a psychological disadvantage owing to the still prevalent public suspicion of all things associated with ionizing radiation. (Loustau-FIRL)
W76-05803

REMOVAL OF DETERGENT FLUORESCENT WHITENING AGENTS FROM WASTE WATER,
CIBA-GEIGY Corp., Greensboro, N. C. Dyestuffs and Chemicals Div.
H. R. Ganz, C. Liebert, J. Schulze, and P. S. Tensby.
Journal Water Pollution Control Federation, Vol. 47, No. 12, p 2834-2849, December, 1975.

Descriptors: *Detergents, *Waste water treatment, Suspended solids, Trickling filters, Solid wastes, Toxicity, Soils, Waste disposal.
Identifiers: *Fluorescent whitening agents(FWA).

Although studies have shown that fluorescent whitening agents (FWA) in detergents are innocuous, little is known as to their removal from water and ultimate disposal. In-depth analyses of representative waste water treatment plants' ability to remove FWA's were made by analysis of solid and liquid influent and effluent. On the whole, the removal of FWA's in the primary process correlated with the removal of suspended solids. The trickling filter process eliminated much of the remaining FWA's so that average FWA removal was on the order of 95%. FWA content in the settled sludge was in the milligram per liter range. Because these results showed that much of the FWA's discharged into the treatment plants was removed as part of the solid waste component, it was deemed appropriate to determine whether FWA's in sludge landfill could be leached out by rainwater. Core samples from simulated landfill sludge exposed to natural conditions showed that a negligible quantity of FWA's was leached from the sludge over a 70-day exposure period. Since there is some interest in using sludge as a soil improvement agent, the ability of crops to accumulate FWA's from treated soil was studied. It was suggested that FWA's will not likely be taken up by major crops when present in plant-soils. (Loustau-FIRL)
W76-05804

PROGRESS IN METHODS OF NITRATE REMOVAL,
Department of the Environment, Reading (England).
A. H. Goodman.
Water Treatment and Examination, Vol. 24, No. 3, p 1570-1571, 1975. 12 ref.

Descriptors: *Nitrates, *Nutrient removal, *Water treatment, *Waste water treatment, Denitrification, Nitrogen, Methanol, Rivers, Potable water.
Identifiers: *Nitrate removal.

Reduction of nitrate content in water can be accomplished using two broad methods. One method, of which ion-exchange and reverse-osmosis are examples, involves concentrating nitrate into a reject fraction. The other method utilizes biological denitrification. Various studies are being conducted on the conditions necessary for denitrification in biological systems. It was known that denitrification occurred in soils and it was observed that in studies of river water nitrate was reduced even though a high level of BOD was present. It appeared that those responsible for denitrification were heterotrophic organisms which utilized not only organic carbon but also nitrogen. It then became apparent that rivers with much oxidized sewage effluent must contain high proportions of nitrate. Therefore, a denitrification step would have to be incorporated into the sewage treatment plant if the rivers were to be a supply of potable water. One system studied was the addition of methanol to sewage effluent, followed by treatment in a flooded biological filter. Then, to overcome the accumulation of solid matter in the filter, experiments were made with upward-flow units containing sand. An unaccountable loss of nitrogen in the aeration plant led to the use of a small amount of air to keep the solids suspended in the water. Eventually it was found that with little additional cost, 50% nitrate removal was possible in existing treatment plants. Work in denitrification continued with an examination of the mechanism whereby ammonia in river water could be oxidized during upward flow settlement. This led to a fluidized sand bed process with methanol introduced to stimulate denitrification. Because the use of toxic methanol in water being made potable would cause concern, the substitution of reducing sugars for methanol is now under consideration. (Loustau-FIRL)
W76-05805

NITRATE REMOVAL FROM WATER BY ION EXCHANGE,
Water Research Centre, Medmenham (England). Medmenham Lab.
For primary bibliographic entry see Field 5F.
W76-05806

ENGINEERS CAN EXERT PROCESS CONTROL OVER DIGESTER INPUTS,
Envirex, Inc., Milwaukee, Wis.
N. A. Mignone.
Water and Sewage Works, Vol. 122, No. 11, p 51-53, November, 1975. 3 fig, 1 tab, 2 ref.

Descriptors: *Anaerobic digestion, *Activated sludge, Hydraulics, Equipment, Kinetics, *Waste water treatment, Costs.
Identifiers: Thickening, Waste activated sludge, *Flotation thickeners.

Anaerobic digestion can be controlled better by using a dissolved air flotation thickener instead of a gravity thickener. Many of the problems associated with anaerobic digestion of combined primary and waste activated sludge can be attributed directly to hydraulic overload which causes reduction in digester operating temperature, washout of organisms and dilution of system buffering capacity. If a dissolved air flotation thickener is placed immediately before the anaerobic digestion system, hydraulic overload can be prevented and the operation of the system will be vastly improved. Another feature of the dissolved air flotation unit is its function as a secondary grit removal facility. It can also produce a thicker combined sludge, thus allowing for smaller downstream equipment, meaning less capital and maintenance cost compared to past systems. Development work is being undertaken to automate the dissolved air floation unit process in order to maintain the desired solids concentration under the various expected inflow conditions. (Loustau-FIRL)
W76-05807

SLUDGE DEWATERING TRIALS AT BANBURY,
J. M. Sidwick, B. E. Butler, and N. J. Ruscombe-King.
Water Pollution Control, Vol. 74, No. 6, p 675-687, 1975. 4 fig, 3 tab, 3 ref.

Descriptors: *Sludge treatment, *Dewatering, *Centrifugation, Equipment, Polyelectrolytes, Operation, Design criteria, Suspended solids, *Waste water treatment.
Identifiers: Centrifuge machines.

Five centrifuge machines were tested and compared for efficiency in dewatering crude sludge. Of the machines tested, four were long-bowl decanters and one was an internal-bowl machine. During the trial week 23 runs were completed by the machines. The operators were asked to produce a sludge cake containing 22 to 23% dry solids with a centrate containing 750 to 1000 mg/liter. No other constraints were imposed. The same feed sludge was fed to all machines. The results show that all the centrifuges had difficulty in achieving centrate suspended solids concentrations below 1000 mg/liter, but both methods were suitable for dewatering sludge. The long-bowl machines were more successful in producing a cake of the required quality than the internal-bowl machine. After the trial week, one machine was kept for further testing to see whether its results could be improved with different throughput rates and different polyelectrolyte dosages. Recovery improved for that machine as throughput was reduced. For any one throughput, there is an optimum polyelectrolyte dose. At higher throughputs, recovery is more sensitive to changes in polyelectrolyte dose. More detailed analysis of operating variables was not possible during the short time of this trial. (Loustau-FIRL)
W76-05809

INDUSTRIAL COST RECOVERY AND USER CHARGE ASSESSMENTS,
Bovay Engineers, Inc., Spokane, Wash.
For primary bibliographic entry see Field 5G.
W76-05813

AN ECONOMIC MODEL OF WATER USE AND WASTE TREATMENT,
Houston Univ., Tex.
F. D. Singleton, J. A. Calloway, and R. G. Thompson.
Presented at the Second National Conference on Water Reuse: Water's Interface with Energy, Air and Solids, May 4-8, 1975, Palmer House, Chicago, Ill. 27 p., 4 fig., 9 tab., 18 ref. NSF (RANN) GI-34459-2.

Descriptors: *Linear programming, *Industries, *Water utilization, *Waste water treatment, *Estimated costs, Industrial water, Recycling, Mathematical models, Systems analysis, Water conservation.

A model that determines the costs of water use and the best practicable control technology currently available, the best technology economically achievable, and zero waste discharges in existing heavy water-using industries provides total cost estimates and the incremental savings in waste treatment costs gained from redesigning production facilities and reducing each major pollutant. The potential savings in waste treatment costs may be compared with the increased costs of new production facilities to determine the feasibility of

making such an investment. The model can be applied to water use and waste treatment costs for chemicals, petroleum refining, pulp and paper, primary metals, and electric power generation industries. Specific features of the model include (1) use of underlying nonlinear models to determine technical coefficients in the comprehensive linear model, (2) separate accounting for each waste stream component (COD, BOD, oil, ammonia, phenol, sulfides, TDS, and water volume), and (3) the use of both fixed and variable cost components. Use of the model is simple and inexpensive in analyzing a single stream or in interfacing with a linear process model. Use of separate component accounting and nonlinear support models eliminates many of the problems of linear estimation of nonlinear functions. (Auen-Wisconsin)
W76-05814

PORT COLLECTION AND SEPARATION FACILITIES FOR OILY WASTES. VOL. 5. A COMPARATIVE ANALYSIS OF CONCEPTUAL SYSTEM PLANS FOR THE SURVEYED PORTS UNDER THE 'NO DISCHARGE', '1969 AMENDMENTS' AND 'NO SHEEN' CRITERIA,
Harris (Frederick R.), Inc., New York.
R. L. Forster, J. E. Moyer, and C. G. Papacosta.
Available from the National Technical Information Service, Springfield, Va 22161, as COM74 10012 $12.00 in paper copy, $2.25 in microfiche. Report MA-RD-900-74010, August 1973. 463 p. 20 fig., 157 tab., 58 ref.

Descriptors: *Pollution abatement, *Harbors, *Oil wastes, Ships, Estimating, *Treatment facilities, Waste disposal, Governments, Economic impact, Recycling, Regulation, Costs, Equipment, *Separation techniques, *Waste water treatment, Return(Monetary), Industries, Water quality standards.
Identifiers: *Collection facilities(Ships), On-board treatment, No discharge requirement, Zero discharge.

The types of oil wastes brought into ports as exemplified by New York, Hampton Roads, San Francisco, St. Louis, San Diego, Houston, Texas City, Galveston, Miami, Cleveland, and San Juan by non-military shipping were identified and estimates made of quantities, based on total prohibition of overboard dumping, the 1969 Amendments to the 1954 IMCO Convention, and the no sheen criteria, anticipated for 1975 and 1980. Systems for collecting, treating, and disposing of oil wastes with no additional environmental degradation were evaluated to determine if they could be used with the new waste loads, or if they could be modified to suit the new loads, or if new systems had to be developed. Cost estimates were also made for the selected ports. The entrepreneureal potential for private industry to operate the revised oily waste handling systems is discussed. The government's role with respect to the different operations, the ship operator, and the builder is described. The impact on shipping costs is evaluated. A shoreside oil/water separator process facility which could be used in small ports having an oily water waste load of 1.4 million gallons per year or less is described. (Buchanan-Davidson-Wisconsin).
W76-05830

DESIGN AND OPERATION OF HIGH-RATE FILTERS--PART 2,
Montgomery (James M.), Inc., Pasadena, Calif. Water Treatment Div.
S. Kawamura.
American Water Works Association Journal, Vol.67, No. 11, p 653-662, November, 1975. 10 fig, 12 ref.

Descriptors: *Filters, *Design criteria, *Waste water treatment, *Water treatment, *Filtration, Flow control, Flow rates.
Identifiers: *High-rate filters, Backwash, Filter media.

The design of high-rate filters is mostly related to the physical factors of the filter-washing process, the process by which water flows upward through filter media particles. The major factors of the filter-washing process are size and specific gravity of filter media; type and arrangement of filter underdrain system; number, size, and location of wash-water troughs; size and elevation of the wash-water tank, or capacity and head of the wash-water pumps; backwash rate-control system; and type and capacity of auxiliary scour. Of the three basic types of filter-washing processes, the fluidized filter bed is used in the United States, the air-scour wash is practiced in Europe, and the third is a combination of the other two. The article discusses various aspects of filter washing, including appropriate backwash rates. (See also W76-05832) (Loustau-FIRL)
W76-05831

DESIGN AND OPERATION OF HIGH-RATE FILTERS--PART 3,
Montgomery (James M.), Inc., Pasadena, Calif. Water Treatment Div.
For primary bibliographic entry see Field 5F.
W76-05832

RESTORING THE QUALITY OF URBAN RECEIVING WATERS: INTERFACING UPGRADED TREATMENT FACILITIES WITH THE STREAM,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
B. C. Dysart, III, and T. M. Keinath.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 376, $7.50 in paper copy, $2.25 in microfiche. South Carolina, Water Resources Research Institute, Clemson, Report No. 46, June 1974. 172 p, 74 fig, 7 tab, 5 append. S-035-SC.

Descriptors: *Water quality control, *Tertiary treatment, *Waste water treatment, Municipal wastes, Operating costs, Water quality standards, Cities, Management, Pollution abatement.
Identifiers: *Urban water resources, *Waste treatment/stream interfacing.

The research demonstrated the feasibility of employing advanced waste treatment techniques added as adjuncts to overloaded existing conventional waste treatment facilities for protecting urban water resources from further degradation. This is an attractive alternative to construction of additional capital intensive conventional waste treatment units which requires the sale of large bond issues. In contrast, the initial cost of advanced waste treatment units is relatively low even though their associated operating costs are relatively high. Because such units can be placed on- and off-line instantly, however, they will be utilized only when necessary to meet the water quality standards during adverse conditions in the receiving water such as might be encountered during hot, summer, low flow periods. Consequently, the annual cost for such processes, when used as an intermittent adjunct to conventional wastewater treatment facilities, will be considerably less than the comparable cost for expanding facilities in the traditional fashion and operating them continuously. The research delineated the specific advanced waste treatment processes that are most effective, efficient, and adaptable for incorporating them into existing wastewater treatment facilities. The principal contribution was the development of realistic guidelines for adding advanced treatment processes to existing conventional facilities to provide more effective, economical, and reliable management of urban receiving waters.
W76-05839

AN ASSESSMENT OF AUTOMATIC SEWER FLOW SAMPLERS - 1975,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
P. E. Shelley, and G. A. Kirkpatrick.
Environmental Protection Agency, Report EPA-600/2-75-065, Dec 1975. 335 p, 29 fig, 6 tab, 32 ref. EPA 1BB034; ROAP 21 ASY; Task 039. 68-03-0409.

Descriptors: *Sampling, *Sewage, *Sewers, Water analysis, Water quality, Water pollution, Effluents, *Storm sewers, Combined sewers, Overflow, Manholes, Outfall sewers, Sanitary engineering, Reviews, Cities, *Evaluation.
Identifiers: *Automatic sewer flow samplers.

A brief review of the characteristics of storm and combined sewer flows is given followed by a general discussion of the purposes for and requirements of a sampling program. The desirable characteristics of automatic sampling equipment are set forth and problem areas are outlined. A compendium of 82 model classes covering over 200 models of commercially available and custom designed automatic samplers is given with descriptions and characterizations of each unit presented along with an evaluation of its suitability for a storm and/or combined sewer application. A review of field experience with automatic sampling equipment is given covering problems encountered and lessons learned. A technical assessment of the state-of-the-art in automatic sampler technology is presented, and design guides for development of a new, improved automatic sampler for use in storm and combined sewers are given. (See also W73-14221) (EPA)
W76-05864

SEWER FLOW MEASUREMENT - A STATE-OF-THE-ART ASSESSMENT,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
P. E. Shelley, and G. A. Kirkpatrick.
Environmental Protection Agency, Report EPA-600/2-75-027, November 1975. 423 p, 37 fig, 41 tab, 186 ref, 8 append. EPA 1BB034;ROAP 21ASY;Task 034. 68-03-0426.

Descriptors: *Flow measurement, *Flowmeters, Liquid flow, Open channel flow, *Pipe flow, Stream flow, Storm sewers, *Combined sewers, Overflows, Manholes, Outfall sewers, Sanitary engineering, Urban areas, *Water pollution control, Water quality, *Reviews.
Identifiers: *Equipment evaluation.

A brief review of the characteristics of storm and combined sewer flows is given, followed by a general discussion of the need for such flow measurement, the types of flow data required, and the time element in flow data. A discussion of desirable flow measuring equipment characteristics presents both equipment requirements as well as desirable features and includes an equipment evaluation sheet that can be used for a particular application. A compendium of over 70 different generic types of primary flow measurement devices, arranged according to the fundamental physical principles involved, is presented along with evaluations as to their suitability for measurement of storm or combined sewer flows. To illustrate the implementation of the physical principles, a number of commercially-available devices for flow measurement are briefly described. A review of project experience in flow measurement is presented along with a summary of current and on-going research efforts. Some thoughts on future areas of research and development are also given. (EPA)
W76-05865

IMPACTS OF HYDROLOGIC MODIFICATION ON WATER QUALITY,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 5G.
W76-05866

NTERIM REPORT ON THE IMPACT OF 'UBLIC LAW 92-500 ON MUNICIPAL POLLU- 'ION CONTROL TECHNOLOGY,
Municipal Environmental Research Lab., Cincinati, Ohio.
. W. Lykins, Jr., and J. W. Smith.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 212, 9.75 in paper copy, $2.25 in microfiche. Report PA-600/2-76-018, January 1976. 303 p, 48 fig, 35 ab, 31 ref, append. EPA 1BB033.

escriptors: Water pollution, Sewage treatment, Vaste treatment, *Reviews, Water quality, Waste water treatment, *Treatment facilities, Technology, Water quality standards, Surveys, esearch priorities, Regulation, *Municipal astes.
lentifiers: Water quality limited stream segents, *Public Law 92-500.

his report presents available information that is sed to examine the impact of water quality quired by Public Law 92-500 on the effluent ıality discharged from publicly owned wastater treatment plants and assesses the adequacy existing technology to meet these requirements. ffluent standards that are more stringent than the ıtional minimum requirement for 'secondary' eatment are identified. A major effort was voted to reviewing state water quality stanrds, identifying all water quality limited stream gments within each state, and summarizing and aluating concentrations of pollutants in mucipal wastewater treatment plant effluents reorted in the 1973 Needs Survey. A comparison of isting technology with projected needs indicates at some form of technology is available to hieve the required removal of suspended solids, trogen and phosphorus. However, development d demonstration of additional technology are eded to reduce BOD concentrations to th quired limits and to provide alternate disinfec n processes. (EPA)
76-05867

ME USE IN WASTEWATER TREATMENT: ESIGN AND COST DATA,
own and Caldwell, Walnut Creek, Calif.
S. Parker, E. de la Fuente, L. O. Britt, M. L. ealman, and R. J. Stenquist.
ailable from the National Technical Information Service, Springfield, Va 22161, as PB-248 181, 75 in paper copy, $2.25 in microfiche. Environtal Protection Agency, Report EPA-600/2-75-3, October 1975. 298 p, 63 fig, 67 tab, 7 ref, 2 apnd. EPA 1BB043; ROAP 21-ASD; Task 18 68-0334.

scriptors: Sludge disposal, *Dewatering, sign, *Waste water treatment, *Lime, perating costs, Chemical precipitation, Sludge atment, Ulmate disposal, Solid wastes, Cenugation.
ntifiers: *Chemical sludge processing, Cenugal classification, *Centrifugal dewatering, calcination, Chemical treatment.

sign and cost information on lime use in wastter treatment applications is presented. Include lesign and cost information on lime handling, uid processing, solids generation and dewater-, lime recovery and ultimate ash disposal. A ign manual approach is used so that the infor- ion presented has maximum usefulness to enonmental engineers engaged in both the concep- and detailed design of wastewater treatment nts. Design data on alternate sludge thickening dewatering processes are presented with spe- emphasis on wet classification of calcium carate from unwanted materials and on maximizthe dewatering of wasted soilids. Alternative lcining techniques are assessed and problem is identified. A relatively new technique for eficiation of the recalcined product is ented. Approaches to heat recovery are ented that minimize the net energy requirements for recalcination and incineration. A computer program for computation of solids balances is included as a design aid and two case histories are presented which portray the cost of lime treatment, sludge processing and lime reclamation. (EPA)
W76-05868

[illegible] UNICIPAL TREATMENT [illegible] 240, AND CS-137, [illegible] ne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5F
W76-05890

PROCESS AND EQUIPMENT FOR AUTOMATIC CHEMICAL-BIOLOGICAL WASTEWATER TREATMENT WITH PROVISIONS FOR RECYCLE AND REUSE,
Environment One Corp., Schenectady, N. Y. (Assignee).
R. P. Farrell, Jr., and J. L. Setser.
U.S. Patent No. 3,920,550, 8 p, 3 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 940, No 3, p 1370, November 18, 1975.

Descriptors: *Patents, *Waste water treatment, *Domestic wastes, *Sewage treatment, *Water pollution treatment, Aerobic treatment, Settling basins, Waste disposal, Soil disposal fields, Water reuse, Impaired water use. Recirculated water.

A waste disposal system is provided that will retain a minimum amount of sludge, discharge a high quality effluent consistently which can be reused in various ways or recycled for flushing purposes. The waste first flows through a grinding mechanism and is then deposited in a holding tank where it accumulates to a predetermined quantity, [illegible] which time a pump unit is actuated to transfer the waste to a treatment tank. In the aerobic treatment and settling tank air is pumped through the waste material to enhance the aerobic action of the microorganisms present for decomposing the waste material. Alternatively, or in addition, an agitator may be employed if necessary. When a predetermined quantity of waste material is present within the treatment and settling tank, the automatic controls are actuated to first feed and mix a flocculating chemical and then provide an absolutely quiescent period where additional raw waste will not be discharged from the holding tank, air will not enter the treatment and settling tank and the agitator, if present will be inoperative. After this settling period, most of the clarified supernatant will be pumped out into an effluent storage vessel. Sludge is removed to be further treated by microorganisms. The effluent storage tank receives the effluent from the treatment and settling tank, and may be used to supply a recycle demand system and dose the drain field; or it may be pumped to an irrigation system, a ground water recharge system, a suitable receiving stream, etc. (Sinha - OEIS)
W76-05955

EVAPORATOR-CONDENSER UNIT FOR PRODUCING POTABLE WATER FROM SEWAGE,
F. W. Taylor
U.S. Patent No. 3,930,960, 6p, 6 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 115, January 6, 1976

Descriptors: *Patents, *Liquid wastes, *Sewage effluents, *Waste water treatment, Water pollution treatment, Water quality control, Potable water, Heat transfer, Evaporation, Condensation, Separation techniques, Condensers, Evaporators.

An evaporator-condenser unit includes an elongated enclosed chamber into which hot gases are injected to form a cyclonic stream. The hot gases impinge and pass around a substantial number of tubes containing relatively cool sanitary liquid waste. Condensation forms on the tubes and is blown by the cyclonic action of the hot gas stream to the outer periphery of the chamber where the condensation is collected and conveyed away from the chamber. At the same time, the heat from the hot gases is transferred to the liquid sanitary waste which is converted into steam in a steam expansion chest at the top of the cyclonic chamber. The steam is compressed and injected back into the hot gas stream flowing into the cyclonic chamber. The steam is then condensed on the tubes and conveyed away for appropriate utilization. Clogging of the tubes by solid matter is prevented by means of a periodic blow down operation which forces the material in each of the tubes under high pressure into the steam expansion chest. The steam expansion chest includes a sump which collects the liquid and solid waste. The cooled gases after passing through and about the tubes is conducted away from the cyclonic chamber to a discharge stack. (Sinha-OEIS)
W76-05960

WASTEWATER TREATMENT,
Sterling Drug, Inc., New York. (Assignee).
P. V. Knopp, and W. B. Gitchel.
U.S. Patent No. 3,930,998, 6 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 427, January 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Biological treatment, Water pollution treatment, Water pollution control, Nigrogen compounds, Denitrification, Ammonia, Biomass, Fertilizers.

A method is described for simultaneously removing organic carbonaceous material and nitrogenous material from sewage under improved conditions so as to accelerate the rate of removal of nitrogen. The rate of denitrification is accelerated by providing a suitable oxygen acceptor which may be substituted for acetate, methanol or other commercial organic biodegradeable material used as an oxygen acceptor. The invention also provides for the removal and recovery of a portion of the nitrogen for a fertilizer. In the process wastewater containing reduced nitrogenous compounds is mixed with active nitrifying organisms and an oxygen-containing gas for a sufficient length of time to convert substantially all of the nitrogenous material to the nitrate form. The nitrifying organisms and accumulated biomass are recycled to remove a portion of the accumulated biomass from the nitrifying step. Nitrified wastewater is contacted with heterotrophic denitrifying organisms and an organic carbon source for a length of time sufficient to reduce the nitrate nitrogen to elemental nitrogen. Denitrifying organisms and accumulated biomass are separated from the denitrified wastewater and finally a final effluent with nitrogen removed is separated. The biomass removed from the nitrifying and denitrifying steps is heated in the presence of an oxygen-containing gas and converted to ammonia nitrogen. Ammonia is removed from the resulting liquid phase. (Sinha - OEIS)
W76-05961

ION EXCHANGER FOR THE TREATMENT OF WASTE WATER,
S. E. Jorgensen.
U.S. Patent No. 3,931,003, 4 p, 3 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 428, January 6, 1976.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Water pollution control, *Ion exchange, Separation techniques, Chemical reactions, Precipitation, Flocculation, Cellulose, Bark, Ammonia, Phosphates.
Identifiers: Sulphonated bark.

Waste water containing dissolved high molecular organic compounds, ammonium ions and phosphate ions is pre-treated with a chemical

selected from the group consisting of precipitating agents and flocculating agents and then is passed through a bed consisting of a cellulose ion exchanger impregmated with betamanganese dioxide. The effluent is passed through a bed consisting of activated carbon impregnated with betamanganese dioxide. By passing pretreated waste water through the beds in the prescribed sequence, a particularly efficient treatment is achieved. A special advantage of the ion-exchanger material is that it can be eluated by means of sodium hydroxide so that all phosphate and ammonium nitrogen ions can be removed. (Sinha - OEIS)
W76-05962

METHOD OF TREATING WASTE LIQUIDS FROM PHOTOGRAPHIC PROCESSINGS,
Fuji Photo Film Co., Ltd., Kanagawa (Japan). (Assignee).
I. Shimamura, and H. Iwano.
U.S. Patent No. 3,931,004, 7 p, 9 ref; Official Gazette of the United States Patent Office, Vol 942, No 1 p 429, January 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution control, Water pollution treatment, *Ion exchange, *Resins, Chemical reactions, Separation techniques, Anion exchange.
Identifiers: *Photographic processing wastes, Cyanides, Farmer's reducer.

A method of treating waste liquids from photographic processings containing ferricyanide ions and/or ferrocyanide ions is described. A reducer is used for correcting or reducing the developed density of excessively exposed or excessively developed images or fringed or fogged images which are undesirable for making printing masters. The most commonly used reducers contain ferricyanide and thiosulfate. The reducers are different from each other only in the concentration of ferricyanide and thiosulfate. Recently, such reducers have been called Farmer's reducers in the art, often comprising potassium ferricyanide and sodium thiosulfate. It has been discovered that if ammonium thiosulfate is added to the Farmer's reducer or sodium thiosulfate in the Farmer's reducer is replaced with ammonium thiosulfate, the ion-exchange power of the weakly basic anion-exchange resin is increased and thus the recovery efficiency for ferricyanide ions and/or the ferrocyanide ions by the ion-exchange resin after regeneration is remarkable increased. (Sinha - OEIS)
W76-05963

PROCESS FOR SEPARATING OIL FROM EMULSIONS OF OIL IN WATER,
A. Gasser.
U.S. Patent No. 3,931,005, 5 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 429, January 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Industrial wastes, Water pollution treatment, Water pollution control, Water quality control, *Oily water, Emulsions, Flocculation, *Separation techniques, Chemical reactions, Iron compounds, Polymers, Hydrogen ion concentration.

A single stage process which serves to separate oil from stable emulsions of oil in water, particularly from sewage which consists of or contains such stable emulsions of oil in water, is described. An iron salt, such as ferric sulfate or ferric chloride is added to the oil-containing sewage in a collecting container for these emulsions. The contents of the container are thoroughly mixed, e.g., with compressed air, and sodium hydroxide solution, preferably together with oil, such as mineral oil, is added to the resulting mixture in the reaction container itself or while the mixture flows to a reaction container and at such a rate that a pH value of 5.5-6.5 is obtained. Subsequently an aqueous solution of high molecular weight water soluble polymeric flocculating agent is added to the mixture. After mixing and then allowing it to stand for a sufficient period, it stratifies into two phases. When the separation for flotation has been effected, the oilfree clear water which has been separated and the oil-containing sludge are withdrawn in succession. The plant for carrying out the process comprises generally a reaction container and a unit which is comprised of a number of containers respectively intended to collect the emulsion, for the sludge, the old oil and the sodium hydroxide solution. (Sinha - OEIS)
W76-05964

METHOD OF REDUCING SLUDGE ACCUMULATION FROM TAR SANDS HOT WATER PROCESS,
Great Canadian Oil Sands Ltd., Toronto (Ontario). (Assignee).
R. A. Baillie, and J. V. D. Fear.
U.S. Patent No. 3,931,006, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 429, January 6, 1976.

Descriptors: *Patents, Effluents, *Water pollution control, *Mine water, *Settling basins, Sludge, Waste water, *Sludge treatment, Dispersion, Recirculated water, Reclaimed water, Water reuse, Compaction, *Waste water treatment.
Identifiers: Tar sands.

The invention relates to a process for treating a retention pond containing the effluent discharge normally provided when bitumen is recovered from tar sands by way of hot water extraction techniques. Specifically, the process provides a means to improve the settling of the sludge portion of the retention pond in which effluent discharge is stored. The method essentially comprises discharging the effluent from the hot water extraction procedure in a manner so that it is widely dispersed over the surface of the retention pond. This method of adding effluent discharge to the pond allows the sand particles in the effluent to rain down on the pond and thereby rain down through the sludge layer at the bottom of the pond. By this procedure, a part of the dispersed silt and clay in this sludge layer is included in the interstitial volume between sand grains so as to provide a pond containing a substantially smaller sludge layer volume. As a result of the method, more of the water in the pond is suitable for recycle to the hot water extraction technique thereby incorporating efficiencies of water usage in separation of bitumen from tar sands. (Sinha - OEIS)
W76-05965

METHOD OF EXTRACTING HEAVY METALS FROM INDUSTRIAL WASTE WATERS,
Nippon Electric Co. Ltd. Tokyo (Japan). (Assignee).
I. Sugano, T. Tsuji, and M. Kanamori.
U.S. Patent No. 3,931,007, 6 p, 3 fig, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 429, January 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water pollution control, Water quality control, *Heavy metals, Suspension, Oxidation, Chemical precipitation, *Separation techniqus.
Identifiers: Ferrous ions.

A method of extracting heavy metals from acid-containing waste water solution comprises adding to the solution ferrous ions and a base selected from the group consisting of hydroxides and carbonates of alkali metals and alkaline earth metals and ammonium hydroxide. The amount of ferrous ions added is at least 2 times the amount in mols of the total mols of heavy metals present other than iron. The amount of base added corresponds to 0.9 to 1.2 equivalent of acid radicals present in the solution. This provides a suspension of metal hydroxides including ferrous hydroxide. An oxygen containing gas is bubbled into the suspension to oxidize it and form a crystalline precipitate of essentially at least one of the ferric compounds selected from the group consisting of ferrites, magnetite and oxyhydrate of iron containing the heavy metals. The precipitate is separated to obtain clean water. (Sinha - OEIS)
W76-05966

APPARATUS FOR THE TREATMENT OF LIQUID WASTES,
CIBA-GEIGY Ltd., Basel (Switzerland) (Assignee).
J. C. Page, A. Rappaz, and U. Frauchiger.
U.S. Patent No. 3,931,008, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 430, January 6, 1976.

Descriptors: *Waste water treatment, *Patents, *Industrial wastes, *Chemical wastes, Water pollution treatment, Water pollution control, Water quality control, Separation techniques, Chemical reactions, Chemical precipitation, Waste dilution, Equipment.

An apparatus is described which treats liquid wastes from commercial or industrial production and processing plants. The wastes because of their chemical nature or content of chemical substances are chemically not compatible with one another and may react to each other to form precipitates, foam, gases, or other toxic substances. Therefore the wastes must have pretreatment to convert them so they can be combined and diluted before being discharged into general effluent streams, sewage installations, settling basins, etc. An apparatus for the treatment of at least two liquid wastes is comprised of an addition zone for the addition of treatment substances, a sedimentation zone for the separation of precipitates and liquid and a dilution zone in which the separated liquid is diluted. The use of pumps is restricted as far as possible and transport of quantities of liquid or substantial volume takes place under the action of gravity. At the same time products which separate out and from which valuable chemical substances can be recovered are isolated. (Sinha - OEIS)
W76-05967

WATER PURIFICATION APPARATUS AND TIMING DEVICE FOR INITIATING BACKWASHING CYCLE,
For primary bibliographic entry see Field 5F.
W76-05968

SEWAGE TREATMENT SYSTEM,
Atlantic Fluidics, Inc., Stamford, Conn. (Assignee).
H. Huse.
U.S. Patent No. 3,931,012, 7 p, 9 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 431, January 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water pollution control, Water quality control, Water purification, Filtration, Incineration, Sludge disposal, Oxygenation, Ozone, Ultimate disposal.

A system incorporating a highly effective, self-cleaning, mechanical filtering means to separate solids from water as soon as possible after the pollutants have been flushed into the system is described. This device is located at the site where the pollution originates and therefore its effectiveness is enhanced by reducing the time of contact between water and organic contaminants. A maintenance-free fully automatic incinerator is provided to reduce the solids totally to inert ash after separation of solids from water. This is accomplished in an electically operated incinerator utilizing high intensity radiant heat to evaporate and degasify the solids in the absence of oxygen, and by means of an electrically operated afterburner

ully consume the organic emission. The total in-ineration is accomplished without air pollution in he form of smoke, odors, or vapor plume. A torage or retention tank is provided for the fil-ered effluent and means to pump it to a series of eactor columns in which the effluent is purified y means of contact with ozone. The ozone, roduced from air or pure oxygen, is injected into ie bottom of the column and it rises by gravity to ie top. The water, is introduced at the top of the olumn and it flows downward in a counter-cur-nt direction in relation to the ozone. The sewage eatment system can be split into separate com-onents with the separator-filter and incinerator cated at the site of sewage generation and the ef-uent treatment system and ozonator located at a mote site. (Sinha - OEIS)
76-05969

ETHOD OF PREVENTING SCALE FROM EING DEPOSITED IN CASE OF PRODUCING RESH WATER FROM SEA WATER,
dustrial Science and Technology, Tokyo apan). (Assignee).
or primary bibliographic entry see Field 3A.
76-05971

ETHOD FOR THE PRIMARY AND SECON-ARY TREATMENT OF WASTEWATER IN A NITARY APPARATUS,
itotrol Corp., Milwaukee, Wis. (Assignee).
. N. Torpey, and R. A. Sullivan.
S. Patent No. 3,932,273, 5 p, 5 fig, 5 ref; Official zette of the United States Patent Office, Vol 2, No 2, p 884, January 13, 1976.

scriptors: *Patents, *Waste water treatment, omestic wastes, *Sewage, Water Pollution con-l, Water pollution treatment, *Biological treat-nt, Settling basins, Aerobic conditions, Oxida-n, Seperation techniques, Equipment.

method utilizing a composite apparatus for the atment of wastewater to remove settleable, atable solids and to remove and oxidize organic tter includes a treatment tank having at least horizontally adjacent bay. Each of the bays an upper biological treatment zone seperated horizontal baffle from a lower settling zone. w wastewater enters the settling zone of one of bays where settleable and floatable solids are ioved, and then turns vertically to flow in a ection through the upper biological treatment e of each bay. The wastewater flows through primary and secondary upper zones where ible pollutants are oxidized by the aerobic ies that grow and maintained on rotating con-tors. Then the wastewater flows through the ondary settling zones where residual solids, arily mature slimes sloughed off from the con-tor, are removed. The wastewater after ing through the secondary settling zones is drawn from the end of the tank opposite the in which the waste water was initially in-uced. (Sinha-OEIS)
-05972

CESS FOR THE TREATMENT OF ERAL SLIMES,
ix Resource Recovery Systems, Inc., Dayton, . (Assignee).
. Mewes, R. W. Styron, and M. H. Smith.
Patent No. 3,932,275, 6 p, 3 fig, 1 tab, 5 ref; ial Gazette of the United States Patent Of-Vol 942, No 2, p 884-885, January 13, 1976.

riptors: *Patents, *Waste water treatment, r purification, *Industrial waste, *Mine s, Water pollution sources, *Fly ash, lectrolytes, Dewatering, Phosphates, *Waste sal, Flocculation, Coagulation.
ifiers: *Mineral slimes, Phosphate mining in-y.

In a number of mining industries such as copper, iron, potash, phosphate, etc., waste products from the processing present serious disposal problems. Slimes are an aqueous suspension of ultrafine soil solids which are associated with the ore and which are put into solution during the processing. Mineral slimes exhibit colloid-like property that is believed to be largely responsible for their poor dewatering characteristic. A feasible method for dewatering mineral slimes while at the same time disposing of fly ash involves the controlled addition of fly ash and then a polyectrolyte to the mineral slime. By slowly mixing these ingredients into the slime, flocculation occur and coagulated settle out producing a clear water layer which may be drawn off by decanting or other means. The fly ash is added at the rate of approximately 0.2% by weight of the total slime solution to be treated. Fly ash as collected by the precipitators at coal burning power plants may be used in the process either in dry or aqueous slurry form. Preferably the dry fly ash is slurried (with any sufficient amount of water) or otherwise conditioned so that it may be easily and thoroughly mixed with the slime then the polyelectrolyte is added. The polyelectrolyte may be any of the well known polymer materials such as polyacrylamide, polyethylene oxide, polyethyleneamine, polyvinyl aromatic sulfonates; but is preferably a low anionic polyacrylamide. (Sinha-OEIS)
W76-05973

FILTER CLEANING METHOD,
Sterling Drug, Inc., New York. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05974

MULTI-TANK ION EXCHANGE WATER TREATMENT SYSTEM,
Rock Valley Water Conditioning, Inc., Rockford, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05975

DISSOLVED AIR FLOATATION SYSTEM,
Tenco Hydro/Aerosciences, Inc., Countryside, Ill. (Assignee).
G. A. Ettelt.
U.S. Patent No. 3,932,282, 5 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 942, No 2, p 887, January 13, 1976.

Descriptors: *Patents, *Waste water treatment, Water pollution control, Water quality control, Water purification, *Flotation, Coagulation, *Aeration, Flow, Low flow, Equipment, Bubbles.

A waste treatment system is capable of removing particulate from a liquid mixture using the dissolved air flotation principle. A dissolved air flotation system for very small flows includes a flotation column having a greater vertical height than width for vertical flotation. An inlet is provided to the flotation column for carrying the combined waste and released bubbles from air-charged water. The column includes a release well comprising an inverted, truncated cone having an open base to permit upward flotation of the combined waste and bubbles. The inlet is coupled to the release well to provide tangential flow and helical flow in the release well thereby slowing the flow and preventing breakage of the bubbles. A clarified water outlet is provided at the lower portion of the flotation column. The outlet comprises a pipe defining openings on its circumference for passage of the water. A debris trap is at the top of the pipe whereby passage of clarified water into the pipe can only be accomplished through the openings. The system includes a positive displacement pump for pumping recycled water and an air column for damping the recycled water flow. A solubilization column is provided for dissolving air bubbles in a circulation route. A flotation cell is provided with an expansion valve on the downstream side of the solubilization column and on the upstream side of the flotation cell, for releasing the air from the water that has been air-charged. The air bubbles and coagulated waste are combined and released in the flotation cell to float to the top where they are discharged. (Sinha-OEIS)
W76-05976

METHOD AND APPARATUS FOR THE ANAEROBIC DIGESTION OF DECOMPOSABLE ORGANIC MATERIALS,
Bio-Gas of Colorado, Inc., Denver. (Assignee).
F. T. Varani.
U.S. Patent No. 3,933,628, 7 p, 6 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1343, January 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water pollution treatment, Water quality control, *Anaerobic conditions, *Solar radiation, *Anaerobic digestion, Digestion tanks, Methane, Heat transfer, Temperature control, Decomposing organic matter.
Identifiers: Synthetic fuel production.

The principles and techniques used in waste water treatment can, with certain changes, be made adaptable to a synthetic fuels facility where the emphasis becomes one of gas production rather than potable water. These changes amount to a modification of the feed composition so as to optimize gas production, selecting operating temperatures most favorable to the methane-producing (methanogenic) bacteria and controlling the latter through the use of a solar-heated heat sink covering the digestor. Anaerobic bacterial decomposition of organic waste materials can be accomplished by covering and sealing the digestor with a liquid-filled pond forming a heat sink, then roofing over the latter with a translucent dome, preferably inflatable, which transmits solar energy to the fluid in the sink, and then using the fluid thus warmed as the heat transfer medium for maintaining the digestor temperature within prescribed limits. The digestor preferably comprises a trench capable of retaining the feed-stock, the open top of which is both closed and sealed by means of a cover that functions as the receptable for the fluid in the pond. This cover can float on the feedstock slurry in the digestor and the effluent from the digestor is ideally suited for use as the heat transfer medium in the pond because its dark brown to black color is highly absorptive of the solar energy. (Sinha - OEIS)
W76-05981

PURIFICATION OF WASTE WATER CONTAINING PHTHALIC ESTERS,
Rhone-Progil, Courbevoie (France). (Assignee).
J. Helgorsky, and M. Auroy.
U.S. Patent No. 3,933,630, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1344, January 20, 1976.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Water pollution control, Water quality control, *Chemical wastes, *Industrial wastes, Separation techniques, Chemical reactions, Organic compounds, Alcohols.
Identifiers: *Phthalic esters.

One of the processes which is most widely used on an industrial scale for the production of dialkyl phthalates is esterification of the corresponding alcohol by phthalic anhydride or acid in the presence of sulfuric acid acting as a catalyst. In order to purify the dialkyl phthalate, the neutral or acid esters are subjected to a series of operations: careful hydrolysis of the esters, destruction of the neutral alkyl sulfate, neutralization of the acid functions by a base, washing operations, or decantation operations; this results in waste waters comprising all the water-soluble impurities from the process and particularly the salts of organic acid, and a small amount of the unreacted starting materials

for the esterification operation. A process for the purification of waste water resulting from the production of phthalic esters by esterification of phthalic acid or anhydride with alcohols having more than 4 carbon atoms comprises acidifying the waste water with a strong acid to attain a free acidity of the waste water greater than 0.05 N and extracting the acidified water with an alcohol having more than 4 carbon atoms for removal or organic impurities from the acidified water. (Sinha - OEIS)
W76-05982

METHOD OF TREATMENT OF SLUDGES WITH SIZE-ADJUSTED CARBON,
T. Seki.
U.S. Patent No. 3,933,634, 9 p, 4 fig, 1 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1345, January 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Sludge treatment, *Separation techniques, *Water pollution treatment, Coagulation, Coals, Lignite, Filtration, Water purification, Incineration, Sludge disposal.

A process for concentrating and separating solids from solid/liquid mixtures in the treatment of sewage sludge is described. The process comprises incorporating into such sludge 2 to 10% by weight of fine dust coal or lignite having such a size distribution that 30 to 50% by weight of the whole particles have a finer size not greater than 100 mesh and 70 to 50% by weight of the whole particles having a size exceeding 100 mesh, mixing them under agitation, incorporating into the mixture a coagulant of the iron-aluminum type in an amount of from one-fiftieth to one-tenth of the fine dust coal or lignite, allowing the sulting mixture to stand still for about 20 minutes to 2 hours to separate it into a coal-containing concentrated sludge and a supernatant liquor. The coal-containing concentrated sludge is further subjected to filtration treatment to remove water. When the sludge is introduced on filtering material the coarser particles of the fine dust coal are first allowed to sediment on the filter cloth to form a precoat layer, then agglomerates of finer particles are sucked and deposited in the form of a compressed sludge layer. The water content of the resulting filter cake is low and the filter cake can readily be used as fuel for incineration of rubbish and refuse. (Sinha - OEIS)
W76-05985

METHOD FOR REMOVING SOLUBLE SELENIUM FROM ACIDIC WASTE WATER,
Department of the Interior, Washington, D. C. Office of the Secretary. (Assignee).
W. N. Marchant.
U.S. Patent No. 3,933,635, 3 p, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1345, January 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Acidic water, Water pollution treatment, Water pollution control, Water quality control, Separation techniques, Reduction(Chemical), Zinc.
Identifiers: Selenium, Zinc smelter effluents, Scrubber water.

An effective, rapid and economical removal of selenium from acidic waste water solutions may be achieved by treatment of such solutions with a metallic reducing agent. The method is particularly applicable to removal of selenium from zinc smelter effluent by treatment of the effluent with metallic zone. It may also be employed for removal of selenium from other aqueous wastes such as those from copper refining processes, scrubber solutions from coal burning operations, etc. In addition, other metallic reducing agents such as iron or aluminum may be used. Optimum temperature and pH for precipitation of selenium will vary considerably depending upon the specific waste water treated and the reducing agent employed. A temperature of about 25 deg to 85 deg C and a pH of about 1 to 4 is suitable. A time of about 1 to 10 minutes is sufficient for maximum precipitation of the selenium. Following completion of the reaction, precipitated solids, consisting predominantly of selenium and any unreacted reducing agent, may be separated from the remaining solution by any conventional means such as filtration, decanting, etc. (Sinha - OEIS)
W76-05986

METHODS AND APPARATUS FOR TREATING WASTEWATER,
Airco, Inc., Montvale, N. J. (Assignee).
B. S. Kirk, and R. M. Chappel.
U.S. Patent No. 3,933,640, 9 p, 6 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1347, January 20, 1976.

Descriptors: *Patents, Waste water treatment, *Sewage treatment, *Water pollution treatment, Water pollution control, Water quality control, *Oxygenation, Activated sludge, Microbial digestion, Mixing, Equipment

Methods and apparatus treating wastewater, such as municipal sewage, are provided in which an oxygen enriched feed gas is supplied to an oxygenation changed and oxygen is efficiently dissolved in wastewater (mixed liquor) by means of a static mixing device. The chamber is preferably submerged in a large body of wastewater being treated, such as is commonly found in the secondary stage of an activated sludge wastewater treatment system with the chamber being adapted receive such wastewater from a location slightly below the surface. Oxygenated wastewater is discharged from the chamber in either radical or multi-directional pattern at a sufficient velocity to effect a thorough mixing of the oxygenated wastewater and the large body of wastewater contained in the secondary stage treatment tank. The overall concentration of dissolved oxygen in the wastewater is maintained throughout a tank to a level sufficient to sustain microbial digestion or organic waste while providing the requisite stirring necessary to preclude settling of solids from the wastewater. (Sinha - OEIS)
W76-05987

SEWAGE TREATMENT AND RECYCLING SYSTEM,
Environs Engineering Enterprises, Inc., Honeybrook, Pa. (Assignee).
L. C. Hadden, and C. T. Benjamin.
U.S. Patent No. 3,933,641, 5 p, 5 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1348, January 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water pollution control, Water quality control, Septic tanks, Domestic wastes, Aerobic conditions, Filtration, Chlorination, *Water reuse, *Recycling, Irrigation, Water conservation.

A sewage treatment system for residential or commercial application comprises a septic tank having suitable compartment for initially treating the sewage by aerobic bacterial action. The effluent flows from the septic tank onto perforated splash pan which is designed to distribute the effluent evenly over the surface of a first filter which is removable. The effluent flows through this first filter and then flows through a second filter in which the coliform and biological oxygen demand are reduced to acceptable levels. This filtered effluent then flows into a holding tank from which it is pumped to a pressure tank. Prior to entering the pressure tank the effluent is chlorinated and then discharged or pumped to the surface. The treated effluent can be used in irrigation or plumbing system of the facility to which the system is connected. (Sinha - OEIS)
W76-05988

FLOCCULATION APPARATUS,
For primary bibliographic entry see Field 5F.
W76-05989

REVERSE OSMOSIS SEPARATION APPARATUS,
Toray Industries, Inc., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W76-05990

APPARATUS FOR THE SEPARATION OF LIQUID MIXTURES MY MEANS OF PERMEABILITY SELECTIVE SEPARATION MEMBRANES,
Louis Schleiffer A. G., Feldbach (Switzerland) (Assignee).
For primary bibliographic entry see Field 3A.
W76-05991

CLEAN WATER GRANT PROGRAM.
In: 1975 BNA Environmental Rep 721:0509 - 1 (Calif. Water Code). 10 p.

Descriptors: *California, Grants, *Treatment facilities, *Water pollution treatment, *Construction costs, Administration, Cost allocation, Water policy, Economics, Water cost, Capital costs, State governments, Government finance, Payment, Administrative costs, Administrative agencies, Project planning.

To implement the Clean Water Bond Law of 197 California has herein provided for a Clean Wat Grant Program to assist in the financing of trea ment works necessary to prevent water pollutio The State Water Resources Control Board sh compile a project list including treatment wor proposed and under construction and shall assi priorities to each project according to stipulat criteria. All such projects must be accompanied a project report providing technical, environme tal, and financial information. Submission of co struction grant requests for the preparation plans, drawings and operation manuals, and construction grant requests for eligible proje costs must satisfy the application procedur Eligible project costs include those costs wh are necessary and ordinary costs of constructi of treatment works, and which comply with st and federal rules. The Division of Water Quality the state board evaluates completed applicatio and certifies the proposed project to the Enviro mental Protection Agency. Upon certification, t applicant shall execute a grant contract providi for pro rata installments of grant payments. A discretionary action by the state board or divisi is open to review upon timely petition by the app cant. (Welch-Florida)
W76-06064

THERMAL PROCESSING AND LAN DISPOSAL OF SOLID WASTE.
Environmental Protection Agency, Washingto D.C.
Federal Register Vol. 39, No. 158, p. 29327-293 August 15, 1974. 12 p.

Descriptors: *Standards, *Administrative ag cies, *Waste disposal, *Landfills, *Adoption practices, Local governments, Classificati Structural design, Operations, Inter-agen cooperation, Planning, Legislation, Coordinati Federal government, Structures, Programs, Wa types.
Identifiers: *Administrative guidelines, *Wa disposal(Land), Solid Waste Disposal Act.

In April of 1973 the Environmental Protect Agency published guidelines in response to age and public comment on earlier guidelines conce ing thermal processing and land disposal of so wastes. This document reviews those comme before setting out the 1974 requirements recommended procedures. The guidelines apply

ermal processing facilities processing more than
fty tons a day of municipal waste not including
azardous, agricultural and mining wastes. The
idelines provide that owners and operators of
ermal processing facilities shall determine
hether special wastes can be processed and by
hat methods. Examples of special wastes which
ould be excluded are set forth, as well as
quirements and procedures for site selection,
ter quality, air quality, safety, and recordkeep-
. Where there is a solid waste land disposal site,
operations must meet minimum requirements.
for federal agencies, the guidelines are manda-
y whether the site is on federal property or not.
aste from a non-federal source disposed on
deral land must also meet the requirements.
nkins-Florida)
6-06082

SIGNATION AND DETERMINATION OF MOVABILITY OF HAZARDOUS SUB-ANCES FROM WATER.
vironmental Protection Agency, Washington,
C.
r primary bibliographic entry see Field 5G.
6-06084

VIRONMENTAL PROTECTION AGENCY--ULTRY PROCESSING PRODUCTS, OPOSED PERFORMANCE AND PRETREAT-NT STANDARDS.
vironmental Protection Agency, Washington,
C.
primary bibliographic entry see Field 5G.
6-06096

. Ultimate Disposal Of Wastes

TIMAL GROUNDWATER QUALITY NAGEMENT: WELL INJECTION OF STE WATERS,
nell Univ., Ithaca, N. Y. School of Civil and
ironmental Engineering.
primary bibliographic entry see Field 5B.
5-05507

SURFACE DISPOSAL OF LIQUID INDUS-AL WASTES,
artment of the Environment, Ottawa
tario). Inland Waters Directorate.
primary bibliographic entry see Field 5B.
-05573

TECTING GROUNDWATER FROM LAND-L LEACHATE,
oming County Planning Commission, William-
t, Pa.
primary bibliographic entry see Field 5G.
-05599

ERIMENTS ON THE OPTIMIZATION OF OGE DEWATERING AND ON THE USE OF K AND SLUDGE IN THE BRICK INDUS- (VERSUCHE ZUR OPTIMIERUNG DER LAMMENTWAESSERUNG UND ZUR VER-TUNG VON RINDE UND SCHLAMM IN ZIEGELINDUSTRIE),
rtechnische Stiftung, Munich (West Ger-
).
rimary bibliographic entry see Field 5D.
05704

TROL OF COAGULANT RECOVERY M EFFLUENT SEDIMENT (KONTROL' ENERATSII KOAGULYANTOV IZ OSAD-TOCHNYKH VOD),
ino-Issledovatel'skii Institut Sanitarnoi iiki i Oborudovania Zdanii i Sooruzhenii,
USSR).
Medvedev, M. I. Dontsova, V. P. Tkachuk,
Semenov, and I. G. Alesina.
Bumazhnaya Promyshlennost, No. 9, p 15-16, Sept., 1975. 2 fig.

Descriptors: *Sediments, *Coagulation, *Effluents, *Aluminum, *Sludge treatment, Calcium hydroxide, Hydrogen ion concentration, Water pollution sources, Volumetric analysis, Acids, Sludge.
Identifiers: *Coagulants, Chemical recovery, Aluminum sulfate, Sodium bicarbonate, Sodium hydroxide, Aluminum hydroxide, Aluminum chloride, Aluminum compounds.

Data available on the control of aluminum recovery from effluent sediments (sludge) show that the recommended pH is in many cases lower than the pH of saturated solutions of aluminum sulfate or chloride. A study of laboratory sediments (obtained by mixing aluminum sulfate with sodium bicarbonate, NaOH, and calcium hydroxide) showed that the age of the sediment and the alkaline component affect the time-dependent changes of pH, i.e., the rate of dissolution. This means that the pH of the regeneration process depends on the properties of aluminum hydroxide, which is determined by the cationic composition of the effluent and the age of the sediment. Thus, i n each case the pH must be determined experimentally. The simplest method would be by titration of the sediment with a dilute acid. However, in titrating old sediments containing a considerable amount of organic substances, frequently flat titration curves are obtained and the inflection point is difficult to detect. Use of a differential titration curve proved to be accurate and reproducible in tests with laboratory-prepared and mill sediments (from coagulation of effluents that have and have not been subjected to biological purification). A line drawn through the peak of the differential curve perpendicular to the abscissa and to the integral titration curve gives the amount of acid required and the optimum pH. (Stapinski-IPC)
W76-05725

EXPERIENCES AND POSSIBILITIES WITH THE ANDRITZ-SEM DOUBLE WIRE PRESS FOR SLUDGE DEWATERING, PARTICULARLY IN THE PAPER, PULP AND BOARD INDUSTRY (ERFAHRUNGEN UND MOEGLICHKEITEN MIT DER ANDRITZ-SEM DOPPELSIEBPRESSE BEI DER SCHLAMMENT-WAESSERUNG, INSBESONDERE IN DER PAPIER-, ZELLSTOFF-UND KARTO
Maschinenfabrik Andritz A. G., Graz (Austria).
E. Tutschek, and A. Wohlfarter.
Wochenblatt fuer Papierfabrikation, Vol. 103, no. 23/24, p 931-934, Dec. 15, 1975. 5 fig, 1 illus, 5 ref.

Descriptors: *Sludge treatment, *Dewatering, Equipment, Design, Operation and maintenance, Pulp and paper industry, Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Sludge, Sewage, Foreign countries, Solid wastes, Water pollution control, Water quality control.
Identifiers: *Andritz-Sem dewatering press, Austria, Fillers.

The design and operating principles of the Andritz-Sem double-wire press, developed by Maschinenfabrik Andritz (Graz, Austria), are explained. Examples of its use on mixed sludge from a fine paper mill, on mixed sludge from the two-stage biological clarification unit of a sulfite mill, and on the primary sludge from a board mill are discussed, and some other uses indicated. The influence of fiber and filler content on sludge dewatering is also indicated. (Ward-IPC)
W76-05729

MUNICIPAL WASTEWATER ODOR STILL A PROBLEM--PART 1,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W76-05773

POND AND IRRIGATION SYSTEMS OFFER ECONOMY AND FLEXIBILITY,
William and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 5D.
W76-05774

WASTEWATER RENOVATION AND REUSE:AN URGENT ENVIRONMENTAL NEED,
For primary bibliographic entry see Field 5D.
W76-05777

DESIGN, OPERATION, AND MONITORING OF MUNICIPAL IRRIGATION SYSTEMS,
Williams and Works, Grand Rapids, Mich.
S. K. Malhotra, and E. A. Myers.
Journal Water Pollution Control Federation, Vol. 47, No. 11, p 2627-2639, November, 1975. 3 fig, 3 tab, 21 ref.

Descriptors: *Irrigation, *Waste water disposal, Operating costs, Tertiary treatment, Hydraulics, Michigan, Groundwater quality, *Design, *Operations, *Monitoring, Municipal wastes.
Identifiers: Land disposal.

Land disposal systems for municipal waste water provide a system with simplicity and low operating and maintenance costs. The various land disposal systems under construction or currently in operation in Michigan are continuously dosed seepage, intermittently dosed seepage, flood irrigation, ridge and furrow irrigation, solid set spray irrigation, traveling sprinkler spray irrigation, and center pivot sprinkler spray irrigation. Generally, the need for secondary treatment and winter storage has led to the use of oxidation ponds. Irrigation rates are detailed for hydraulic loading, organic loading, nitrogen loading, and phosphorous loading. Of the three most commonly used irrigation systems -- flooding, ridge and furrow, and spraying -- flooding is best for flat and expensive land, ridge and furrow for flat land with medium to heavy soils, and spraying for steeply sloping sites. Farmers prefer spray irrigation for proper and effective crop management. Perennial grasses are the most popular crops, but corn is being grown at some sites successfully. To date none of the irrigation systems in Michigan has been found to result in a significant degradation of the chemical or bacteriological quality of the groundwater in its surrounding areas. Groundwater quality data from some of the systems in operation are listed in tables. (Loustau-FIRL)
W76-05783

INCINERATION'S ROLE IN ULTIMATE DISPOSAL OF PROCESS WASTES,
Incinerator Co., Huntington (England).
K. S. Dunn.
Chemical Engineering, Deskbook issue, p 141-150, October 6, 1975. 5 fig, 4 tab, 16 ref.

Descriptors: *Incineration, *Waste disposal, *Recycling, Organic compounds, Oxidation, Equipment.
Identifiers: Waste heat, Refractories.

With the possibility of reclaiming a product or recovering waste heat, incineration as a final disposal process becomes increasingly interesting. To destroy satisfactorily organic material, the furnace volume must be sized for the physical bulk of material as well as for its calorific value. The correct combustion-air requirements must be met and velocities must be selected to ensure thorough mixing through turbulence in the combustion zone. The high-temperature zones must have a gas path of sufficient length and volumetric capacity to complete the combustion of volatiles. Whether the process of oxidation is to be carried out in grate space or in gas space must be considered. The most flexible incinerator designs for a range of applications are the multichamber/multicell units and the rotaries. Fluid-bed incineration is not very

flexible and power consumption is high, but with waste-heat recovery the costs may be offset. The multiple-hearth incinerator has found many successful aplications in the metallurgical industry as well as being applied to municipal and industrial wastes, but it is not very flexible either. Flexibility is important because within two or three years from entry into service, wastes will change as the process is modified. As a result, refractory materials must have the flexibility of coping with temperature changes. Monolithics, or refractories taken into service in an unfired state, are replacing brick as the first choice for incinerator work. Among emission collectors, the venturi scrubber is the most popular, but a new two-phase jet system is being studied. (Loustau-FIRL)
W76-05791

EDINBURGH'S SEWAGE-TREATMENT AND DISPOSAL SCHEME,
Edinburgh Corp., (Scotland).
For primary bibliographic entry see Field 5D.
W76-05794

REMOVAL OF DETERGENT FLUORESCENT WHITENING AGENTS FROM WASTE WATER,
CIBA-GEIGY Corp., Greensboro, N. C. Dyestuffs and Chemicals Div.
For primary bibliographic entry see Field 5D.
W76-05804

SEWAGE TREATMENT SYSTEM,
Atlantic Fluidics, Inc., Stamford, Conn. (Assignee).
For primary bibliographic entry see Field 5D.
W76-05969

PROCESS FOR THE TREATMENT OF MINERAL SLIMES,
Amax Resource Recovery Systems, Inc., Dayton, Ohio. (Assignee).
For primary bibliographic entry see Field 5D.
W76-05973

METHOD OF TREATMENT OF SLUDGES WITH SIZE-ADJUSTED CARBON,
For primary bibliographic entry see Field 5D.
W76-05985

CORPS ISSUES INTERIM RULES FOR DISCHARGES OF DREDGED AND FILL MATERIALS.
For primary bibliographic entry see Field 5G.
W76-06061

WASTE DISCHARGE REPORTS AND REQUIREMENTS.
For primary bibliographic entry see Field 5G.
W76-06065

MICHIGAN WASTEWATER REPORTING AND SURVEILLANCE FEES RULES.
Michigan Dept. of Natural Resources E. Lansing. Water Resources Commission.
For primary bibliographic entry see Field 5G.
W76-06067

THERMAL PROCESSING AND LAND DISPOSAL OF SOLID WASTE.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-06082

NAVIGABLE WATERS PROCEDURES AND GUIDELINES FOR DISPOSAL OF DREDGED OR FILL MATERIAL.
For primary bibliographic entry see Field 5G.
W76-06097

5F. Water Treatment and Quality Alteration

POLLUTION CONTROL SYSTEM FOR WATER SUPPLY,
Facuzzi Bros., Inc., Little Rock, Ark. (Assignee).
R. E. Horan, Jr., and F. M. Nash.
U. S. Patent No. 3,928,197, 4 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1782, December 23, 1975.

Descriptors: *Patents, Water quality control, *Water treatment, Water pollution control, *Water purification, *Chlorination, *Disinfection, Filtration, Water supply.

A method is described for supplying a safe and palatable water service from a water system. The system has a pump connected to a water source and a service line. A receptacle assembly is used as a chlorinator which is so designed and so coupled into the flow line of the system so as to automatically supply chlorine at a flow rate which varies with the demand of the service. The receptacle assembly has an outer container preferably of fiber glass having an opening at it upper end, into which a closure with a depending neck is threaded. A collapsible bag of non-porous plastic is securred to the neck. A flow passageway is provided in the container and an additional one is in the collapsible bag. Flow connections establish a pressure differential which is a function of the pressure drop in the flow line which varies with the service demands on the system. The collapsible bag contains chlorine solution. If the system is quiescent, the pressure equalizes. Upon a demand for service a pressure differential developes resulting in the partial collapse of the bag and a discharge of the contents of the bag into the system. Once the ratio of chlorine solution to water has been established by adjustment of the metering valve, as the flow of water increases, the pressure differential across the chlorinator will likewise increase thus tending to maintain a substantially constant ratio of chlorine to water. Provision is made for refilling the collapsible bag. (Sinha-OEIS)
W76-05530

SYNERGISTIC COMPOSITIONS CONTAINING 2,2-DIBROMO-3-NITRILOPROPIONAMIDE AND 3,3,4,4-TETRACHLOROTETRAHYDROTHIOPENE-1,1-DIOXIDE AND THEIR USE,
Betz Labs., Inc., Trevose, Pa. (Assignee).
R. H. Brink, Jr., B. F. Shema, and P. Swered.
U.S. Patent No. 3,928,198, 5 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1783, December 23, 1975.

Descriptors: *Patents, *Water treatment, *Water pollution control, *Slime, *Aquatic microorganisms, *Industrial water, Biocontrol, Fungicides, Bactericides, Damages, Cooling water, Pulp and paper industry.
Identifiers: Biocides, DBNP, Diamond Shamrock DS-649.

The invention provides methods and compositions for controlling slime-forming microorganisms in aqueous systems such as cooling water systems and pulp and paper mill systems, for controlling slime formation or microorganisms populations in aqueous bodies in general such as lakes and ponds. The method employs a combination of 2,2-Dibromo-3-nitrilopropionamide, called DBNP, and 3,3,4,4-Tetrachloro-tetrahydrothiopene-1,1-dioxide, available commercially as Diamond Shamrock DS-649. The combination is added to the particular system being treated in a quantity adequate to control the slime-forming microorganisms which are contained by, or which may become entrained in, the system which is treated. The weight ratio of the DBNP to the Diamond Shamrock DS-649 ranges from about 95:5 to about 35:65, either compound being present in such a quantity as to impart a synergistic behavior to the composition as a whole. When the two ingredien are mixed, the resulting mixtures possess a hig degree of slimicidal activity of the individual i gredients comprising the mixture. (Sinha-OEIS)
W76-05531

DETECTION DEVICES FOR USE IN SOLUTIO PROCESSING SYSTEMS,
Water Purification Associates, Cambridge, Mas (Assignee).
C. Calmon.
U.S. Patent No. 3,928,200, 7 p, 8 fig, 2 tab, 5 r Official Gazette of the United States Patent O fice, Vol 941, No 4, p 1783, December 23, 1975.

Descriptors: *Patents, *Water treatment, *Wa quality control, *Water softeni *Demineralization, *Ion exchange, *Cont systems, Automation, Scheduling, Monitoring.

A device is described for controlling the operati of a water softening system. The device dete certain points in the operating cycle such as t softening, the backwashing, the regeneration, a the rinse subcycles. The device is placed in cont with the processed solution at or near the syst output so that the dimensional changes of the exchange material causes a flexing of the substr material. This is used as a switch in the control c cuitry for controlling the operating time of one more of the subcycles of operation. The detec utilizes an ion exchange material in film, fiber granular form placed on the surface of a relativ rigid but flexible solid material. The active exchange materials are applied to the surface the solid material in their most expanded fo When the detector is in contact with solution c taining multi-valent ions, the ion exchange mat al shrinks so as to cause the overall structure deflect, or bend. The same detector can be used determine the end of the rinse subcycle as presence of mono-valent salt ions causes the exchange material to extend to its original p tion. (Sinha-OEIS)
W76-05532

USE OF POLYMERIC QUATERNARY A MONIUM BETAINES AS WATER CLARIFIE
Petrolite Corp., St. Louis, Mo. (Assignee).
R. S. Buriks, and A. R. Fauke.
U.S. Patent No. 3, 929, 635, 10 p, 3 ref; Offi Gazette of the United States Patent Office, 941, No 5, p 2233, December 30, 1975.

Descriptors: *Patents, *Water purification, :W Treatment, Water Quality control, Water pollu control, Water pollution treatment, Suspen solids, Flocculation, Coagulation, Chemical r tions, Waste water treatment.
Identifiers: Settling, *Betaines.

Water containing suspended particles is clari by treating the water with polymeric quatern ammonium betaines. It is described how polym and copolymers of dicarboxylic anhydrides s as maleic anhydride are derived f copolymerizable compounds such as olefins, v compounds, etc. The polymers cause rapid flo lation and reinforce the formed aggregates of ticles causing a general tightening or bon together of the initial particles and an increa rate of coagulation and settling. Clarification take place either in a natural body of water or take place in hydraulic thickeners of kn design. Water to be treated may be of natural o tificial origin such as surface water, indus water and/or sanitary water. The water may treated during, or after use or prior to disp (Sinha - OEIS)
W76-05544

WATER TREATING APPARATUS,
Ecodyne Corp., Chicago, Ill. (Assignee).
E. H. Dohnert.

.S. Patent No. 3,929,640, 4 p, 1 fig, 4 ref; Official azette of the United States Patent Office, Vol 41, No 5, p 2234, December 30, 1975.

escriptors: *Patents, *Water treatment, *Water urification, *Water quality control, *Water sofning, Flow control, Coagulation, Chemical reacons, Application equipment, Waste water treatent, Organic wastes.

water treating apparatus is of the type well nown in the art for softening water by the cold me-soda ash process, and for the clarification of aters containing suspended solids, color, and ornic impurities by coagulation with alum or ferric lfate or other coagulants. Coagulation and sofning may be carried out simultaneously. The ater treating apparatus is an open tank having a lindrical side wall and bottom. A partitian within e tank defines a settling zone containing means r removing treated water. An uptake member fines a mixing and recirculation zone and has a wer opening. Upward directed nozzles are ncted to an intake within the perimeter of the wer opening. Precipitates from a collecting zone e mixed with liquid passing through the nozzles d are passed into the mixing and recirculation ne. To soften water by this process, lime is ded to precipitate the calcium bicarbonate as lcium carbonate and the magnesium salts as gnesium hydroxide. Soda ash is added to react th the calcium chloride and calcium sulfate iginally present in the water as well as that rmed by the reaction of lime with magnesium loride and sulfate. A coagulant such as alum dium aluminate, or ferric sulfate is employed in treatment to assist in the separation of the turlity and precipitates formed from the water. If rilization and reduction in organic matter are quired, chlorine is also used in the treatment. nha - OEIS)
76-05547

REDOX-IN SITU PURIFICATION OF OUND WATER,
ckholm Univ. (Sweden). Dept. of Geology.
O. Hallberg, and R. Martinell.
ound Water, Vol. 14, No. 2, p 88-93 Marchril 1976, 6 fig, 1 tab, 22 ref.

scriptors: *Iron, *Manganese, Permeability, ater treatment, Iron bacteria, Clogging, Aera-.
ntifiers: *Vyredox method.

abundance and relative purity of ground water rantees its increase in usage. In some localities, content of iron and manganese in ground water o high that these metals must be removed be- the water can be used for drinking or industriurposes. Iron occurs in two states of oxidation nature,-the divalent (ferrous) and trivalent ric) forms. The Vyredox method developed in and and used now in Sweden oxidizes the fer- ion, which is soluble in water, to the ferric which is insoluble, before the water enters the . The Vyredox method achieves a high degree xidation in the strata around the well. The od makes use of iron oxidizing bacteria and tion wells. A number of aeration wells are ed in a ring around the supply well. Water is ed down the aeration wells but first it is ssed and then enriched with oxygen. The oxrich water provides a suitable habitat for the oxidizing bacteria which assist in the oxidaof ferrous iron. The process must be repeated ecific time intervals to avoid further increases on content. The process of precipitating iron e aquifer has only a slight effect on aquifer eability. Cloggage of the aquifer surrounding ell should not occur for a period many times r than the life span of a typical well. Formurovide estimates of the time in which aquifer age can occur and the radius at which aeravells should be placed. (Gass-NWWA)
05553

EXAMINATION AND REMOVAL OF IRON IN GROUNDWATER,
Sunnittelukeskus-MKR, Helsinki (Finland).
For primary bibliographic entry see Field 5B.
W76-05571

WATER CLARIFICATION SETTLER.
Soviet Patent SU 446472. Issued May 16, 1975.
Soviet Inventions Illustrated, Vol. W, No. 43, p D5, December 2, 1975.

Descriptors: *Patents, *Water treatment, *Sludge disposal, Sedimentation, Equipment, Treatment facilities, Waste water treatment.
Identifiers: Sludge compression chamber, *Clarification chambers.

A patent has been granted for a water clarification settler. The clarifier is partitioned and has a multilayer charge in its upper section, while its lower section forms a sludge compression chamber. Clarification is accelerated with truncated conical baffles, located over the sludge compression chamber, on the center line of the unit. The baffles have their larger end up and are made with side ports. The lower section has clarified water inlets and a chamber filled with side ports. The lower section has clarified water inlets and a chamber filled with gravel to encourage agglomeration and to guide liquids to the multilayer charge area. Baffles with ports separate the clarification zones from the compression zones. Sludge is removed through channels and clarified water is removed through tubes. (Kramer-FIRL)
W76-05578

EFFECT OF THE OPERATIONAL TEMPERATURE IN REVERSE OSMOSIS METHOD (GYAKU SHINTO HO NI OKERU SOSA ONDO NO EIKYO),
For primary bibliographic entry see Field 5D.
W76-05592

THE SAFE DRINKING WATER ACT OF 1974: A MANAGEMENT IMPACT STATEMENT.
For primary bibliographic entry see Field 5G.
W76-05656

REVERSE OSMOSIS PLANT HELPS CITY COPE WITH DIMINISHING GROUNDWATER SUPPLY,
Dacy (G. H.) Associates, Inc., Miami, Fla.
G. H. Dacy.
Water and Sewage Works, Vol. 122, No. 12, p 70-73, December, 1975. 2 fig, 2 tab.

Descriptors: *Groundwater, *Water supply, *Reverse osmosis, *Water treatment, Municipal water, Florida, Pumps, Valves, Equipment, Costs, Water sources, Bracish water.

Diminishing supplies of groundwater forced the city of Venice, Florida, to consider alternate water sources. After considering various possibilities, the city chose a reverse osmosis plant that would draw on a supply of brackish water in the Upper Tampa/Lower Hawthorne strata. The supplier of the plant, Polymetrics, must test the plant and then install it in the city's new facilities. The Polymetrics reverse osmosis plant has membranes of eight inch duPont hollow fiber Permasep permeators that produce a nominal initial 14,000 gpd of desalted water per permeator. The primary elements of this system are well pumps, 5-micron prefilters, hex and acid injection pumps, high pressure pumps, permeators, reverse osmosis blocks and stages, block flow controllers, degasifier, product transfer pump and valve, permeator cleaning system, and electrical controls and instruments. The projected costs of 43.8
W76-05779

TORONTO'S APPROACH TO PREVENTIVE MAINTENANCE FOR TREATMENT PLANTS,
Metropolitan Toronto Dept. of Works (Ontario). Water Pollution Control Div.
E. H. Baldock.
American Water Works Association Journal, Vol. 16, No. 11, p 614-616, November, 1975. 1 fig.

Descriptors: *Computers, Equipment, *Waste water treatment, *Water treatment, *Maintenance, *Treatment facilities, Data collections, Canada.
Identifiers: Toronto(Ontario), Coding system.

Toronto's new program for preventive maintenance of treatment plants employs a computer to administer the program. In order to prepare the computer, all the equipment of the vast plants had to be reinventoried, renumbered, and reviewed. A numbering system for all equipment, with provisions for additions, replacements, and exchanges, had to be devised. Initial data had to be collected on computerized forms. Processes and maintenance cycles had to be recorded. With the data supplied to the computer, it will print out, on a weekly basis, the list of components to be serviced at each plant for each week. The computer work order will list the component identification number, the level of maintenance required, a list of tools required for the function, and an estimated number of man-hours required for the task. A report of all work done will be stored in the computer. The article details the coding system used by the Toronto Department of Works. (Loustau-FIRL)
W76-05780

WATER FACTORY 21 IS THE FUTURE,
Toups Corp., Santa Ana, Calif.
W. R. Mills, and L. J. Ewing.
Water and Wastes Engineering, Vol. 12, No. 11, p 34-36, November, 1975. 1 fig.

Descriptors: *Water treatment, *Water reuse, *California, *Water supply, Costs, Treatment facilities, Waste water treatment, Groundwater, Recharge, Saline water barriers, Recycling.
Identifiers: Water Factory 21.

Water Factory 21 is the first of a kind which injects a combination of desalted seawater and reclaimed waste water into the groundwater basin for domestic use. The combined capacity of 30 mgd will provide for the water needs of one tenth of Orange County, California, residents while providing the necessary design, construction, and operating technology for the future development of water supply factories. In addition, Water Factory 21 supplies the 30,000 acre-feet of water necessary to create an effective fresh water barrier against seawater intrusion. The factory is made up of three separate facilities, a desalting plant, a waste water reclamation unit, and an underground basin. Present estimates indicate that costs of operation of Water Factory 21 will range from 32 to 38 cents per 1,000 gallons, a price comparable to the anticipated costs of supplying water from other sources. The facility recycles water and creates an easily expandable water source. (Loustau-FIRL)
W76-05782

LIME RECOVERY AND REUSE IN PRIMARY TREATMENT,
Brown and Caldwell, Walnut Creek, Calif.
For primary bibliographic entry see Field 5D.
W76-05785

PROGRESS IN METHODS OF NITRATE REMOVAL,
Department of the Environment, Reading (England).
For primary bibliographic entry see Field 5D.
W76-05805

NITRATE REMOVAL FROM WATER BY ION EXCHANGE,
Water Research Centre, Medmenham (England). Medmenham Lab.
R. B. Gauntlett.
Water Treatment and Examination, Vol. 24, Part 3, p 172-193, 1975. 5 fig, 5 tab, 13 ref.

Descriptors: *Ion exchange, *Nitrates, *Water treatment, *Groundwater, *Resins, Potable water, Nutrient removal, Economics, *Waste water treatment.
Identifiers: *Nitrate removal.

Methods and results of nitrate removal from water with commercially available resins producing ion exchange are discussed in this paper. Effort has been directed towards developing a resin specific for nitrate in preference to all other common anions found in potable waters including sulfate. For use in testing the continuous ion exchange loop system, resins R and S were used to obtain a conservative estimate of resin performance. In the continuous loop, resin is moved physically from the section where it is regenerated around to the treatment section where it becomes exhausted. From there it is moved around to re-enter the regeneration section, thus both steps occurring simultaneously and continuously. The loop was studied for the effect of the regenerant dose and the effects of the resin circulation rate. A good compromise between regeneration efficiency and nitrate removal was attained by using a dose rate of 0.75 g/min of salt in the water. The continuous loop was then compared with a fixed bed operation and it was found that both systems gave equal nitrate removal, but the continuous loop produced water with a higher alkalinity and a lower chloride content. Ion exchange, as a method for removing nitrate from water, is a feasible method for giving acceptable water. Whether it will be economical compared with other nitrate-removal methods is not yet known. (Loustau-FIRL)
W76-05806

OLD SLOW SAND + NEW RAPID FILTRATION - SEDIMENTATION = SAVINGS,
Camp Dresser and McKee, Inc., Boston, Mass.
J. C. Thompson.
Water and Sewage Works, Vol. 122, No. 11, p 78-80, November, 1975. 4 fig.

Descriptors: *Sedimentation, *Filtration, *Water treatment, Treatment facilities, Control systems, Polymers, Polyelectrolytes, Filters, Turbidity, Massachusetts.
Identifiers: Alum, *Sand filtration.

In the new rapid sand filtration plant in Springfield, Massachusetts, the conventional sedimentation stage preceding filtration was eliminated because of the good quality of water from Little River. After conducting comprehensive studies, an environmental engineering firm determined that sedimentation could be eliminated when a chemical was used for coagulation of solids during filtration. This resulted in a savings of $2.5 million for the city. The new plant consists of influent metering and flow diversion works, mixing and conditioning basins, dual-media filters, wash water storage and pumping facilities, and a control building that houses the new laboratory facilities. It has a capacity of 60 mgd and could be expanded to 180 mgd. After tests were run to compare the performance of alum and polymer as coagulants in the filtration process, it was found that both worked equally well and polymer was cheaper than alum. Since the beginning of operation in November, 1975, the plant has been operating using a cationic polyelectrolyte at a dosage of about 1.4 to 1.5 mg/liter at filtration rates on the order of two to three gpm/sq ft. The filters have been routinely operated for one week between backwashes. No filter has yet shown excessive head loss or breakthrough of turbidity while continuing to deliver water of excellent quality. (Loustau-FIRL)
W76-05808

DESIGN AND OPERATION OF HIGH-RATE FILTERS--PART 2,
Montgomery (James M.), Inc., Pasadena, Calif. Water Treatment Div.
For primary bibliographic entry see Field 5D.
W76-05831

DESIGN AND OPERATION OF HIGH-RATE FILTERS--PART 3,
Montgomery (James M.), Inc., Pasadena, Calif. Water Treatment Div.
S. Kawamura.
Journal American Water Works Association, Vol. 67, No. 12, p 705-708, December, 1975. 2 fig, 3 ref.

Descriptors: Hydraulics, *Filters, *Waste water treatment, *Water treatment, *Design criteria, *Filtration.
Identifiers: Backwash, *High-rate filters.

The hydraulics on the backwash system of high-rate filters are computed and discussed. Wash-water troughs and underdrainage systems of the American fluidization back-wash and the European air-scour back-wash filter system are explained and compared. The author mentions his experimental development of a new type of filter bottom, but adds that in most cases there is little opportunity for experimental studies. The entire discussion and recommendations are addressed to the designer of filters. (See also W76-05831) (Loustau-FIRL)
W76-05832

EFFECT OF MUNICIPAL TREATMENT PROCESSES ON PU-239, PU-240, AND CS-137,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
J. J. Alberts, P. J. Jehn, D. M. Nelson, J. S. Marshall, and M. A. Wahlgren.
In: Radiological and Environmental Research Division Annual Report-Ecology, January through December 1974. p 97-102, (1975) 1 tab, 4 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Plutonium, *Cesium, *Water treatment, *Sewage treatment, Water pollution, *Radioisotopes, Organic waste, Sludge, Illinois, Potable water, Public health.
Identifiers: Chicago(Ill).

Water samples obtained from the Chicago Municipal Water Filtration Plant were analyzed to determine existing concentrations of Pu239, Pu240, and Cs137. Samples of the organic fertilizer, distributed to the public without charge at the Sanitary District, were obtained and similarly analyzed. It appears that very little Pu239, Pu240, is reaching the public through the drinking water source. The only possible source of high levels of radioactive materials could be particulate matter, which is efficiently removed through the filtration process. Although significant amounts of radioisotopes may be concentrated in the organic sludge at the sewage treatment plant, the material appears to be in a form that is not readily available for removal and is unlikely to remobilize. (See also W76-05879) (Chilton-ORNL)
W76-05890

DESALINATION APPARATUS,
Zeoplant Co. Ltd., Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W76-05959

EVAPORATOR-CONDENSER UNIT FOR PRODUCING POTABLE WATER FROM SEWAGE,
For primary bibliographic entry see Field 5D.
W76-05960

WATER PURIFICATION APPARATUS AND TIMING DEVICE FOR INITIATING A BACKWASHING CYCLE,
O. T. Davis.
U.S. Patent No. 3,931,009, 5 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 430, January 6, 1976.

Descriptors: *Patents, *Water purification, *Water treatment, Water quality control, *Aeration, Filtration, Filters, Porous media, Equipment, Waste water treatment.
Identifiers: *Backwashing.

The apparatus has an aeration chamber with openings to permit air to enter. Raw water is discharged in the form of a spray onto the top of a filter chamber located below the aeration chamber. If necessary chemicals are added to the water before it leaves the nozzles. The filter chamber has a circular trough extending around the top for receiving overflowing backwash water. The filter chamber is packed with a filter medium consisting of several layers of different size aggregate. A collector in the form of a header is positioned in the layer of largest aggregate at the bottom of the filter chamber. The aerated and filtered water enters the collector header and from there passes through a control valve into a treated water reservoir located below the filter chamber. When the reservoir is full, a float actuated switch de-energizes the raw water pump shutting off the plant. In order to backwash the filter media, a second header is positioned a short distance below to top of the filter media and connected to the collector header and a pressurized source of backwash water via a solenoid actuated valve. A timing mechanism is provided which energizes the solenoid valve to start the backwash operation for a predetermined duration in response to the number of times the reservoir has been filled and emptied, and the plant is then restored to normal operation. (Sinha - OEIS)
W76-05968

FILTER CLEANING METHOD,
Sterling Drug, Inc., New York. (Assignee).
J. A. Meidl, and T. J. Vollstedt.
U.S. Patent No. 3,932,278, 3 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 942, No 2, p 885, January 13, 1976.

Descriptors: *Patents, *Water treatment, *Water treatment, *Filters, *Filtration, Water quality control, Cleaning, Chlorine, Ozone.

Coatings form on water filters and sewage treatment plant effluent filters which prevent proper operation of the filters. If the filter media is treated with water that has dissolved in it a low concentration of chlorine or ozone, the coatings and agglomerations in the filter are readily removed. Ordinary chlorinated water, having less than about 25 ppm, is not effective. It is necessary to employ 'superchlorinated' water having a chlorine concentration between about 50 and 200 ppm. In the case where ozone is used, the effective concentration is between about 20 and 100 ppm. The chlorine or ozone can be introduced as a gas into the water prior to its application to the filter. Alternatively, the chlorine may be added to the water during the application of the water to the filter by applying to the filter surface a solid source of chlorine such as a hypochlorite salt, e.g., calcium hypochlorite, in amount sufficient to afford the required concentration of chlorine in the water. The optimum contact time between the chlorinated or ozonated water and the filter media lies between about 2 minutes and 1200 minutes, dependent upon the concentration of chlorine or ozone and the thickness of the coating. (Sinha - OEIS)
W76-05974

MULTI-TANK ION EXCHANGE WATER TREATMENT SYSTEM,
Rock Valley Water Conditioning, Inc., Rockford, Ill. (Assignee).
C. H. Yocum.
U.S. Patent No. 3,932,279, 5 p, 2 ref; Official Gazette of the United States Patent Office, Vol 942, No 2, p 886, January 13, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Ion exchange, Demineralization, Resins, Instrumentation, *Waste water treatment.
Identifiers: Regeneration, Sensors.

Two or more ion exchangers are connected in parallel in a water system so as to provide relatively large treatment capacity. The invention provides means for electrically interlocking the exchangers to prevent more than one exchanger from regenerating at a time. The basic exchangers are of a well known construction and each includes a tank containing a bed of ion exchange resin. The interlocking is achieved in a relatively simple and versatile manner and enable any number of exchangers to be installed in the water system without increasing the complexity of the interlocking hardware. This is achieved by disabling sensors of each exchanger whenever any other exchanger is regenerating so that such a sensor is incapable of initiating a regeneration cycle even though regenerations is required. After an exchanger regenerates it is held in standby status and is automatically returned to service use when another exchanger begins its regeneration cycle. (Sinha-OEIS)
W76-05975

METHOD OF OPERATING ION EXCHANGE SYSTEM,
Permutit Co., Paramus, N.J. (Assignee).
J. C. Adams.
U.S. Patent No. 3,933,631, 10 p, 20 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1344, January 20, 1976.

Descriptors: *Patents, *Demineralization, *Water softening, Water quality control, Water purification, *Ion exchange, Resins, Separation techniques, Equipment.
Identifiers: Regeneration.

The invention utilizes an ion exchange system having at least four vessels, each of which contains a bed of ion exchange material that is in a different stage of exhaustion or regeneration from any other bed in the system. Valves and conduits connect the vessels in parallel with each other for primary service, or in series so that the downstream vessel serves as a polisher. The beds are exhausted and regenerated in sequence one after another by connecting various combinations of vessels to form different service and regeneration groups and thereby move the points where the fluid being treated and the regenerant or regenerants are introduced into the system. The number of steps in the exhaustion of each bed will depend on the number of vessels that are connected in parallel in the service groups. Thus, by varying the number of vessels that are connected in parallel, the length of each of the steps in the service cycle may be made to be nearly equal to the length of one of the regeneration steps, the amount of time during which any particular vessel is idle is reduced, and the amount of ion exchange material and the size and number of vessels needed are also reduced. (Sinha - OEIS)
W76-05983

FLOCCULATION APPARATUS,
J. Wilson.
U.S. Patent No. 3,933,642, 5 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1348, January 20, 1976.

Descriptors: *Patents, *Waste water treatment, *Water treatment, *Flocculation, Water quality, Water pollution control, Coagulation, Velocity, Flow control, Equipment.
Identifiers: Velocity gradient.

This process of flocculation utilized in water and wastewater treatment, as well as the chemical process industry, forms aggregates of particles by effecting contact between the particles by means of velocity gradient established in the fluid to be treated. The flocculation is carried out by mixing a coagulant, such as alum, with the fluid to be treated, such as water, and introducing the resultant mixture into the upstream end of a conductor. The conductor is capable of carrying the fluid and mixed coagulant from an upstream inlet end at a relatively high pressure head to the downstream outlet end at a relatively low pressure head. The conductor is comprised of a series of discrete pipe sections, each downstream section having a progressively larger diameter and length with diverging transition member connecting adjacent sections. The sizes of the sections and the transition members are carefully predetermined, as is the radius of curvature of the coil, in the event the pipe is wound, so as to afford a velocity gradient and flow condition throughout the length of the pipe yielding optimum results. (Sinha - OEIS)
W76-05989

REVERSE OSMOSIS SEPARATION APPARATUS,
Toray Industries, Inc., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W76-05990

APPARATUS FOR THE SEPARATION OF LIQUID MIXTURES MY MEANS OF PERMEABILITY SELECTIVE SEPARATION MEMBRANES,
Louis Schleiffer A. G., Feldbach (Switzerland). (Assignee).
For primary bibliographic entry see Field 3A.
W76-05991

OUTBREAKS OF WATERBORNE DISEASE IN THE UNITED STATES, 1971-1972,
Center for Disease Control, Atlanta, Ga.
For primary bibliographic entry see Field 5C.
W76-06138

5G. Water Quality Control

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alex., Va.
For primary bibliographic entry see Field 5D.
W76-05509

ENVIRONMENTAL CONSIDERATIONS IN RIVER BASIN PLANNING AND DECISION MAKING,
Arizona Univ., Tucson, Inst. of Renewable Natural Resources.
For primary bibliographic entry see Field 4A.
W76-05510

RECENT TRENDS IN WATER QUALITY MANAGEMENT AND PROTECTION IN HUNGARY,
National Water Authority, Budapest (Hungary). Water Pollution Control.
P. Paszto.
Working Paper No. 15, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 8 fig, 21 p, 1 tab, 10 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water pollution control, *Management, *Planning, Data collections, Geography, Hydrology, Surface waters, Regions, Protection, Industries, Storage, Effluents, Water transfer, Streams, Oil pollution, Maps.
Identifiers: *Hungary, Catchments, International planning, Diluting water, Reoxygenation.

Pollution control work in Hungary was started around 1950 by the collection of relevant data. These data were used in compiling a water quality map of the country. The quality survey provided the necessary information for planning work. It was realized, however, that a much greater volume of more frequent data is necessary for good planning. Data collection work has been decentralized, while processing work concentrated in a computer center. Round 200 000 data on about 5000 samples taken at 262 regular sampling points are presently entered annually on the data files on suitable carriers. Water quality planning has been subdivided into three groups, namely: in-plant planning; regional planning; and international planning. In implementing these plans, a number of pollution control solutions have been adopted. The most important answer to pollution control is still effluent treatment so that especially in the case of industrial and trade effluents, the need of rational in-plant industrial water management is emphasized, where water saving technologies have proved highly successful. Temporary storage and periodic releasing of such effluents was also found effective. Flow augmentation storage and releases of diluting water have also contributed to insuring the required water quality. As a method of pollution control, successful applications have been made of stream reoxygenation; and finally, the aversion of accidental oil pollutions must also be mentioned here. (Bell-Cornell)
W76-05518

EMULSION BREAKING METHOD,
Texaco Inc., New York. (Assignee).
F. S. Tao.
U.S. Patent No. 3,928,194, 8 p, 7 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1782, December 23, 1975.

Descriptors: *Patents, Water pollution, *Oily water, *Pollution abatement, *Separation techniques, Water pollution sources, *Oil pollution, *Emulsions, Dispersion.

It is often necessary to separate the components of an emulsion of an oily material and water. This separation may be necessary in order to dispose of water without violating pollution regulations or to recover the oil for future use. A method for separating an oil and water emulsion into separate oil and water phases comprises converting the emulsion into a dispersion which will separate into distinct phases upon settling. The conversion to the dispersion is accomplished at ambient temperature by mixing with a demulsifier or by first adding a demulsifier and a sufficient quantity of the material in the emulsified or non-continuous phase to effect an inversion so that the noncontinuous material becomes the continuous phase and then mixing this inverted emulsion until a dispersion is formed. (Sinha-OEIS)
W76-05527

SYNERGISTIC COMPOSITIONS CONTAINING 2,2-DIBROMO-3-NITRILOPROPIONAMIDE AND 3,3,4,4-TETRACHLOROTETRAHYDROTHIOPENE-1,1-DIOXIDE AND THEIR USE,
Betz Labs., Inc., Trevose, Pa. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05531

REMOVAL OF FLOATING POLLUTANTS,
Shell Oil Co., Houston, Tex. (Assignee).
E. V. Seymour, and R. R. Ayers.
U.S. Patent No. 3,928,205, 3 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1785, December 23, 1975.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution treatment, Water pollution control, *Sorption, *Separation techniques.
Identifiers: Pollutant recovery, Endless sorbent belts.

An apparatus for removing a floating liquid pollutant or oil spill from a body of water consists of a tension member and a sorbent tube shaped as an open cylinder through which the tension member is placed. The sorbent tube has a lateral split so that it can be removed from the tension member. The sorbent bodies connected by the tension member form an endless belt which is deployed so as to position the sorbent tube in contact with the pollutants. They are then pulled by lines through a series of rotatable parallel cylinders or rollers which are placed consecutively closer together so that the pollutant is gradually removed over an extended squeezing period. The pollutant is squeezed from the sorbent pads and falls into a funnel and containment means. (Sinha-OEIS)
W76-05533

APPARATUS FOR THE COLLECTION OF BUOYANT FOREIGN MATTER,
F. A. O. Waren.
U.S. Patent No. 3,928,206, 5 p, 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1786, December 23, 1975.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution treatment, *Water pollution control, Overflow, Weirs, Valves, Turbulence, *Separation techniques.
Identifiers: Floating weirs, Catamarans.

A collecting tank comprised of side walls and a rear wall and a substantially open bottom is supported so as to float on a body of water with its upper edge above water level. Water is caused to flow into the collecting tank by means of a vaned impeller which extends between the side walls of the tank and is arranged for rotation about an axis positioned somewhat above water level. Oil or other foreign matter entering the collecting tank is retained by means of a non-return valve arranged downstream of the impeller. This valve is a plate extending between the side walls of the tank which is pivoted at one edge for movement about an axis positioned below water level. The other edge is supported so that it normally extends somewhat above water level by means of one or more floats. This non-return valve is so arranged that it can easily be depressed by the flow of water produced by the impeller so that there is nothing of the nature of a fixed weir over which the water would fall and thus produce turbulence. The impeller is arranged to cooperate with a floor member which extends below water level between the side walls of the tank with a rear edge positioned adjacent and below the periphery of the impeller and a front edge extending forward of the impeller. In operation a river of water and oil flows down over the floor member and in order to minimize the turbulence the entry velocity of the impeller vanes into the water is kept closely the same as the velocity of the water. (Sinha-OEIS)
W76-05534

WATERCRAFT FOR SCAVENGING OIL SPILLAGE,
G. M. Fletcher.
U.S. Patent No. 3,929,644, 5 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2235-2236, December 30, 1975.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution treatment, Water pollution control, Boats, Floating, Skimming, *Separation techniques, *Pollution abatement.
Identifiers: Catamaran-type hull.

A self-propelled watercraft for scavenging oil spillage and other floating debris from the surface of a body of water such as harbor areas has a catamaran-type hull. This provides spaced apart hull sections each of which is equipped with a receiving tank having a substantial volume extending downward below the surface of the body of water. Each tank has an inlet located along and above a generally horizontal deck extending between the hull sections at the water level, and each tank also has an exit opening adjacent the bottom below the deck. The craft is open at its bow to define a mouth which permits a surface layer of the body of water to wash rearward along the deck toward the inlet openings of each tank as the craft is propelled through the water. The oil spillage and other debris is lighter than water and therefore floats while the water accumulations settle toward the bottom of the tank and are removed. Removal of water is effected by reducing the pressure at the exit openings via a venturi flow passage system associated with the exit openings and which reduces the pressure automatically as the craft moves through the water. (Sinha - OEIS)
W76-05548

VYREDOX-IN SITU PURIFICATION OF GROUND WATER,
Stockholm Univ. (Sweden). Dept. of Geology.
For primary bibliographic entry see Field 5F.
W76-05553

PROTECTING GROUNDWATER FROM LANDFILL LEACHATE,
Lycoming County Planning Commission, Williamsport, Pa.
J. S. Walls, and R. E. Cummings.
Water and Sewage Works, Vol. 122, No. 12, p 68-69, December, 1975. 2 fig.

Descriptors: *Groundwater, *Waste disposal, *Public health, *Leachate, *Landfills, Lagoons, Laboratory tests, Environmental effects, Pennsylvania.
Identifiers: Land application.

Several new elements to protect groundwater from leachate contamination have been designed for a sanitary landfill in Lycoming County, Pennsylvania. Because the BOD content of leachate is a danger to public health, the planners intend to collect the leachate and treat it biologically and chemically before recirculating it. The main feature of the design is a continuous multi-layer barrier separating the undisturbed existing earth from the landfill. From bottom to top, the barrier consists of a layer of sand, a 20-mil thick sheet of impermeable PVC, another layer of sand, and a layer of clayey soil. Sets of horizontal drainpipes above the plastic barrier will carry leachate away for treatment and recirculation. Laboratory tests have shown that the leachate strength can be lowered to acceptable levels through use of aeration to provide aerobic stabilization. The Lycoming system will consists of a 10 ft deep million gallon capacity lagoon with seven days retention time. Two 7 1/2 hp vertical aerators will initially furnish the necessary oxygen. The landfill should solve the solid waste disposal problems of a group of adjoining semi-rural counties. The initial rate of waste to be handled by the fill is estimated at up to 400 tons per day. (Loustau-FIRL)
W76-05599

PRECIPITATION MANAGEMENT FOR RECLAMATION OF OVERGRAZED AREAS IN ARID AND SEMI-ARID REGIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-05603

CONTROL OF NITROGEN TRANSFORMATIONS IN SOILS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5B.
W76-05608

APPLICATION OF FACTORIAL ANALYSIS O PRINCIPAL COMPONENTS TO THE CON TROL OF POLLUTION OF SURFAC WATERS,
Institut National de la Sante et (de) la Recherch Medicale, Paris (France).
For primary bibliographic entry see Field 5B.
W76-05632

HOW TO GUIDE GROWTH IN SOUTHEAST ERN NEW ENGLAND, PARTS I, II AND IV O THE DRAFT REPORT.
New England River Basins Commission, Bosto Mass. Southeastern New England Study.
For primary bibliographic entry see Field 6G.
W76-05649

HANLON CREEK ECOLOGICAL STUD PHASE B.
Guelph Univ. (Ontario). Centre for Resourc Development.
For primary bibliographic entry see Field 6G.
W76-05650

STRUCTURING COMMUNICATIONS PR GRAMS FOR PUBLIC PARTICIPATION WATER RESOURCES PLANNING,
Utah State Univ., Logan. Dept. of Civil and E vironmental Engineering.
For primary bibliographic entry see Field 6B.
W76-05652

A STUDY OF PROSPECTIVE WATER POLL TION CONTROL ACTIVITIES FOR THE OH RIVER VALLEY WATER SANITATION CO MISSION (ORSANCO),
Wendell Associates, McLean, Va.
M. Wendell.
Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-242 5 $5.50 in paper copy, $2.25 in microfiche. 68- 2631. Prepared for the Environmental Protecti Agency, Chicago, Illinois, March 1975. 88 p, 3 t

Descriptors: *Ohio River, Water Resourc *Planning, *Monitoring, *Watershed mana ment, *Water pollution control, Water mana ment, Pollution, Water quality control, Ri Basins Commission, Water quality cont Pennsylvania, West Virginia, Kentucky, Ohio, diana, New York, Virginia, Illinois.
Identifiers: *ORSANCO(Ohio River Valley Wa Sanitation Commission), Ohio River Basin.

Orsanco, an eight state agency established compact in 1948, has never had a thorough eval tion of its role, both present and perspective. T agency's central concern is the management of Ohio River Basin. This concern should broadened from concern about the river itself include the entire watershed. Coordination necessary and there are roles that cannot be c ried out by the states or the Federal governme Several recommendations are made. A co prehensive stream data collection and mana ment system should be designed in order discover sources of pollution, model streams, aid in enforcement of water quality regulatio Data must be evaluated promptly and maintain in a data bank of water quality and related data the Ohio River Basin. At the same time Orsa should develop a water planning capability cooperation with other agencies and perhaps dertake some projects on its own. Orsanco ha mission which cuts across state boundaries areas such as stream modeling, development consistent stream standards, achievement equitable allocation of allowable waste loading streams of significance, provision of techn assistance, and preparation of annual informat on the Ohio River Basin. No significant enfor ment role is seen for this agency because Federal dominance in this area. However, Ors co can offer expert testimony based on its m

toring, and can serve as an interstate forum to bring problems to focus and thus aid enforcement. It is stressed that resources should not be stretched too thinly, but should concentrate in priority areas such as stream data system and planning efforts. A statement of Orsanco financing and staffing is given. (Smith-North Carolina)
W76-05654

THE SAFE DRINKING WATER ACT OF 1974: A MANAGEMENT IMPACT STATEMENT.
The American City, Vol. 90, No. 6, p 40-42, June 1975. 3 fig.

Descriptors: Federal government, *Legislation, Water quality control, *Water quality standards, Law enforcement, *Regulation, *Water policy, Non-structural alternatives, *Public health, Water management(Applied), Planning, Public rights, Potable water.
Identifiers: *Safe Drinking Water Act of 1974.

The Safe Drinking Water Act of 1974 brandishes only the stick of federal regulation. The public will be expected to pay for increased services which underlines the importance of the public notification requirement of the act. Failure to inform consumers of contaminant levels, of inability to meet national standards, of inability to perform monitoring of variances and exemptions granted, and of non-compliance with prescribed schedules can result in fines. Continual notification may result in citizen apathy. Impact on water utilities seems negligible although administrative requirements may prove troublesome. Within two years of the effective date of the interim standards, all communities must have baseline analysis of water quality completed including testing for inorganic chemicals, pesticides, and total organic chemicals. These comprehensive tests are required annually for surface supplies. Those using groundwater must test every 3 years. Problems associated with the act include increased bureaucracy, high monitoring costs, lack of testing facilities, limited federal assistance and increased paper work. (Salzman-North Carolina)
W76-05656

EFFICIENCY IN WATER QUALITY CONTROL FOR THE WILLAMETTE RIVER,
Oregon Univ., Eugene. Dept. of Economics.
A. M. Friedman.
The Annals of Regional Science, Vol. 9, No. 1, p 47-54, March 1975. 2 tab, 10 ref.

Descriptors: *Water policy, Water resources development, Planning, Economics, Economic efficiency, *Water quality control, *Cost-benefit analysis, *Alternative planning, Federal government, State government, Water quality standards, Flow augmentation, Chlorination, Oxygenation, Oregon, *Waste assimilative capacity.
Identifiers: *Willamette River(OR), Dynamic programming.

Federal and state policies concerning effluent treatment are combined in planning for the future management of the quality of the Willamette River. The present water quality plans lack economic input. The current planning procedures for river water quality are described and evaluated and shortcomings are listed including the lack of cost-benefit analysis to determine marginal benefit from improved water quality and the lack of cost minimization as an objective. Cost and efficiency criteria are established to develop water quality plans: identify alternative quality control techniques, determine relationship between technique and resulting water quality, and relate costs of techniques to water quality. Efficient methods for improving water quality are outlined and the cost analyzed. These include increasing waste assimilative capacity by flow augmentation, oxygenation by aerators or adding molecular oxygen, or planning the time and place of discharge to keeping with water quality needs. Dynamic programming has been used to determine the optimal set of waste treatment activities and offers a valuable tool toward devising schemes for providing efficiency in planning. Costs, including social ones, can be reduced if all alternatives are considered. (Salzman-North Carolina)
W76-05658

MANAGEMENT OF ENVIRONMENTAL QUALITY: OBSERVATIONS ON RECENT EXPERIENCE IN THE UNITED STATES AND THE UNITED KINGDOM,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
M. M. Hufschmidt.
In: Economic Analysis of Environmental Problems, E.S. Mills ed. Universities-National Bureau Conference. Vol. 26, p 435-453, 1975. Comment by A.M. Freeman, p 453-460.

Descriptors: *Air pollution, *Water pollution, *Pollution abatement, *Environmental control, Cost-benefit analysis, Management, Costs, Benefits, Water management(Applied), United States.
Identifiers: *United Kingdom, *Environmental quality(EQ), National Environmental Policy Act of 1969, Environmental Protection Administration, Standing Royal Commission on Environmental Pollution.

Environmental management policies of the United States and United Kingdom (UK) are analysed with a public investment framework employing an objective function including economic efficiency benefits, operation and maintenance costs, and environmental quality (EQ) benefits with appropriate weighting. In 1970 in the US the National Environmental Policy Act was signed and the Environmental Protection Administration was created which formalized previous incremental efforts. Weighting of various objectives has been established through decision-making processes and EQ has become a national goal. In the UK concern for EQ is long standing, though not as intense. The creation of a Standing Royal Commission on Environmental Pollution and the issuance of a White Paper on environmental protection in 1970 outlined some problems, but only the first steps were taken. The UK's approach balances economic and technological benefits with the costs of environmental deterioration. Information on costs and benefits is scarce and thus judgements are subjective. Emphasis in the UK has been on more active use of existing laws which has made UK policy less striking than that of the US. There are other contrasts. In the US air quality concern led to the establishment of ambient air quality standards and control over new sources, whereas the UK's long experience has been directed at controlling emission sources rather than achieving particular standards. Spectacular results have been achieved in some, but not all, areas. Similarly in the US water quality has been directed toward establishing and reaching standards, whereas the UK has concentrated on obtaining particular effluent levels at a reasonable cost. (Smith-North Carolina)
W76-05659

EFFLUENT DISCHARGE LAW-BURDENS AND CONSEQUENCES FOR THE PAPER INDUSTRY
'&
'&
))(ABWASSERABGABENGESETZ-BELASTU'S UND FOLGERUNGEN FUER DIE PAPIERINDUSTRIE),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
H. L. Dalpke.
Der Papiermacher, Vol. 25, No. 11, p 181-185, November 22,1975. 1 fig, 8 ref.

Descriptors: *Legislation, *Foreign countries, *Water pollution control, *Pulp and paper industry, Effluents, History, Dissolved solids, Biochemical oxygen demand, Chemical oxygen demand, Toxicity, Water quality control, Europe.
Identifiers: *Germany, Settleable solids, Undissolved solids, Solids content.

A short history of effluent legislation is followed by a discussion of the proposed German antipollution law and what effects may be expected on the paper industry. A short appendix explaining the concepts of undissolved solids, dissolved solids, settleable solids, BOD, COD, and toxicity is included. (Ward-IPC)
W76-05712

STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION,
Crown Zellerbach Corp., Camas, Wash.
H. R. Amberg, I. Gellman, and R. H. Scott.
Tappi, Vol. 58, No. 11, p 59-67; No. 12, p 71-75, Nov.-Dec., 1975. 5 fig, 4 tab.

Descriptors: *Water pollution control, *Foreign countries, *Pulp and paper industry, Waste water treatment, Treatment facilities, Water quality control, Governments, Water quality standards, Waste treatment, International commissions.
Identifiers: *Soviet Union(USSR).

A 1975 visit to three selected pulp and paper mills in the Soviet Union (Krasnogorod, Kherson, and Syktyvkar) was undertaken under a cooperative agreement between the United States and Soviet governments, with the objective of determining the status of water pollution control in the Soviet Union and to ascertain if there were any problem areas which would lend themselves to cooperative programs by technologists of the two nations. This report includes descriptions of seven waste water treatment plants and information and observations obtained from meetings with paper industry ministry personnel and an agency responsible for the development and maintenance of water quality standards. Although there are some difference in the U.S. and Soviet practices, there appears to be a number of areas where cooperative programs would benefit both nations. (Sykes-IPC)
W76-05714

POSITION OF A CALCIUM BISULFITE PULP MILL PARTICULARLY WITH RESPECT TO INTENSIFIED ENVIRONMENTAL PROTECTION REQUIREMENTS (DIE POSITION EINER KALZIUMBISULFITFABRIK, BESONDERS IM HINBLICK AUF VERSCHAERFTE UMWELTSCHUTZFORDERUNGEN),
Helsinki Univ. of Technology, Otaniemi Finland.
N.-E. Virkola.
Das Papier, Vol. 29, No. 10A, p V14-25, Oct. 1975. 18 fig, 7 ref, 7 tab.

Descriptors: *Water pollution control, *Pulp wastes, *Sulfite liquors, Water pollution sources, Europe, Closed conduit flow, Operating costs, Capital costs, Water pollution treatment, Biological treatment, Costs, Waste treatment, Wastes, Industrial wastes, Laboratory tests, Model studies, Pulp and paper industry, Bleaching wastes.
Identifiers: *Sulfite pulp mills, *Finland, Kraft mills, Scandinavia.

Sulfite pulp production in Finland will decrease considerably in the near future as many mills switch to the sulfate process. The reasons for this development are examined. An effort is also made to give an idea of the environmental pollution level of present and future sulfate and sulfite mills. In addition, a model is presented for a sulfite pulp mill almost completely free of pollution. Measures required and investment and operational costs involved are described and compared with those of chemical and biological effluent treatment. The model is based on completely closing the bleaching and screening operations using the countercurrent principle. Laboratory and industrial-scale tests concerning the closing of the chlorination bleaching stage are reported. (Speckhard-IPC)
W76-05722

DISTRIBUTION OF LIGNIN IN WATERS OF THE LOURIZAN INLET AS A MEASURE OF CONTAMINATION DUE TO DUMPING OF LIGNOSULFONIC LIQUORS RESULTING FROM PRODUCTION OF CHEMICAL PULP (LA DISTRIBUCTION DE LA LIGNINA EN AGUAS DE LA ENSENADA DE LOURIZAN, COMOMEDIDA DE LA CONTAMINACION A CAUSA DEL VERTIDO DE LEJUAS LIGNIN-SULFONICAS, PROCEDENTES DE LA FABRICACION DE PASTA DE CELULOSA),
A. Fernandez del Riego.
Boletin del Instituto Espanol de Oceanografia, No. 172, p 1-38, March, 1973. 5 fig, 16 ref, 1 tab.

Descriptors: *Pulp wastes, *Water pollution control, Water pollution, Wastes, Industrial wastes, Water pollution sources, Cellulose, Fibers(Plant), Waste water treatment, Waste treatment, Lime, Color, Waste dilution, Sea water, Flocculation, Organic compounds, Biochemical oxygen demand, Alkalinity, Aeration, Foreign countries, Lignins, Pulp and paper industry.
Identifiers: *Spain, Fiber recovery, Black liquors, Lourizan Inlet(Spain), Playa de Placeres(Spain).

It was found that pollution caused by the dumping of kraft pulp (black) liquors near the Playa de Placeres, Spain, could be reduced by recovering cellulose fiber in suspension and implementing improved biochemical purification in reservoirs. It was also found that lime treatment changed the color of the effluents from dark brown to clear yellow. Large-scale dilution of these treated effluents in sea water and consequent flocculation of organic material decreased the BOD of the water. Alkalinity caused by the lime was eliminated through carbonation, by pre-aeration, and by the enormous diluting capacity of the sea water. (Sykes-IPC)
W76-05733

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL. VOL. II,
VTN, Inc., Orlando, Fla.
R. A. Beluche, G. I. Bergstrom, N. W. Hall, and W. McLellon.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 463, $6.00 in paper copy, $2.25 in microfiche. Report No. EPA-530/SW-57d.1 V.2, 1973. 134 p. 27 tab.

Descriptors: *Landfills, *Water table, *Leachate, *Data collections, *Groundwater, *Florida, Monitoring, Environmental effects, Physical properties, Chemical properties, Surface-groundwater relationships, Surface waters, Groundwater recharge, Phytoplankton, Periphyton, Standing crops, Algae, Bacteria, Invertebrates, Air temperature, Rainfall.
Identifiers: Orange County(Fla).

This volume of the final report of a three year demonstration project on a landfill project in a high water table area in Orange County, Florida, contains all the data collected that were related to the environmental assessment of the project. Data were accumulated over a two year period after the initial refuse was deposited. The objective was to show that landfills in a high water table area could be engineered and operated with a minimal impact on the environment. This report consists of statistical tables giving physical and chemical data on surface water and test wells and include pH, alkalinity, acidity, dissolved solids, chlorides, hardness, phosphorus, phosphates, nitrogen, nitrates, nitrites, ammonia, temperature, turbidity, solids, sulfides, conductivity, sulfates, dissolved oxygen, chemical oxygen demand, calcium, magnesium, iron, aluminum, zinc, potassium, sodium, copper, carbon, carbon dioxide, carbonates, and methylene blue active substances. Monitoring results on phytoplankton, periphyton standing crops, algae in plankton and periphyton samples, macroinvertebrates; survival of selected microorganisms in leachate-containing groundwater (non-adjusted and adjusted to pH 6.8-7.0), daily rainfall and temperature; precipitation, and groundwater levels are compiled. Additional monitoring is planned for three more years. (See also W75-12111) (Buchanan-Davidson--Wisconsin).
W76-05744

LEGAL FRAMEWORK OF CO-OPERATION IN THE FIELD OF WATER MANAGEMENT BETWEEN HUNGARY AND HER NEIGHBORING COUNTRIES,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 6E.
W76-05759

REHABILITATING AN 80-YEAR OLD SEWER SYSTEM,
Parsons, Brinckerhoff, Quade and Douglas, Inc., New York.
For primary bibliographic entry see Field 5D.
W76-05764

INDUSTRIAL COST RECOVERY AND USER CHARGE ASSESSMENTS,
Bovay Engineers, Inc., Spokane, Wash.
L. A. Esvelt, G. T. Clark, and R. James.
Water and Sewage Works, p. 65-66, November 1974.

Descriptors: *Cost repayment, *Public utilities, *Waste treatment, *Industries, Industrial wastes, Washington, Assessments, Rates, Storm water.
Identifiers: User charges, Spokane(Wash).

The City of Spokane, Washington, has developed a formula for recovering that portion of the federal grant used for construction of facilities to handle industrial wastes and a method of equitably apportioning user charges according to industrial wastewater and flow characteristics. The industrial cost recovery system is based on those industries likely to discharge a 'processing' type effluent, and whose discharge is either greater in volume than 53 gal/hr on site employee shift/day or has wastewater constituent concentration significantly different from domestic sewage; an assessment system based on the cost of facilities construction per unit of sewage; an assessment system based on the cost of facilities construction per unit of flow, BOD, suspended solids and phosphorus; and assessments computed on a charge for wastewater flow at domestic waste strength plus a surcharge for BOD, suspended solids and/or phosphorus significantly in excess of domestic wastes. The user charge system consists of an equal service charge for all users representing the costs of providing customer services, transporting and treating infiltration and inflow, transporting and treating stormwater, and a planned program for stormwater overflow elimination; a basic user charge for flow at domestic wastewater strength; a user charge adjustment for BOD, SS or phosphorus concentrations significantly different from domestic wastewater. The computations for cost recovery and user charges are given. (Auen-Wisconsin)
W76-05813

DETAILED ECONOMIC MODELS FOR INDUSTRIAL AND OTHER ACTIVITIES,
Bari Univ. (Italy).
G. Nebbia.
Available from the National Technical Information Service, Springfield, Va 22161, as N75 13683, $4.00 in paper copy, $2.25 in microfiche. Presented at the conference on Environmental Quality Management Models, by the Working Group on Regional Residuals, World Health Organization, October 22-25, 1974, Rotterdam, The Netherlands. 27 p. 6 fig., 77 fig.

Descriptors: *Environment, *Pollutants, *Econometrics, *Evaluation, Input-output analysis, Natural resources, Indicators, Intangible costs.
Identifiers: Environmental pollution, Accounting.

The economic analysis of environmental deterioration, although not defined by monetary transactions, must consider such 'commodities' as atmospheric oxygen used for combustion, water pumped from wells and rivers, sea water used for cooling, and generated residuals and wastes. This study proposes a waste accountancy to describe the flows of matter and energy from the environment in a specific time interval and a specific region. The exchanges are presented in physical (natural) units, as weights of matter, energy units for heat, noise, radioactivity, and man-hours or man-years of labor in a conventional input-output matrix. It is postulated that some sort of an annual 'gross physical product', corresponding to the monetary GNP, but describing the physical exchanges and flows of matter and energy through a region, could be developed based on the identification of environmental indicators through waste matrices. The comparison of economic-ecologic accountancies for the same region in different years would give information on the variation in the environmental waste load following changes in population, in population density, in consumption patterns, in raw materials, and in technological processes. The comparison of waste matrices for different regions could give useful information on the effects of environmental conservation policies under different economic and political conditions. (Auen-Wisconsin).
W76-05817

EVALUATION OF QUALITY PARAMETERS IN WATER RESOURCE PLANNING: A STATE-OF-THE-ART SURVEY OF THE ECONOMICS OF WATER QUALITY,
Bovet (Eric D.) Alexandria, Va.
E. D. Bovet.
Available from the National Technical Information Service, Springfield, Va 22161, as AD/A-000 225 $9.00, in paper copy, $2.25 in microfiche. Army Engineer Institute for Water Resources, Fort Belvoir, Va., IWR Contract Report 74-13, December 1974. 263 p. 11 fig., 199 ref. DACW 01 73-C-0043.

Descriptors: *Reviews, *Planning, *Water quality, *Economics, *Water pollution, Costs, Water purification, Impaired water use, Benefits, Technology, Water allocation(Policy), Water management(Applied), Water quality standards, Surface waters, Water pollution sources, Pollutants, Water utilization, Model studies, Water supply, Waste water treatment, Waste disposal, Evaluation, Cost allocation, Optimization, Cost benefit analysis, Economic efficiency, Financial feasibility, Water distribution(Applied), Groundwater resources, Cooling water, Recreation, Pollutant identification, Indicators, Industrial water, Municipal water.
Identifiers: Water quality requirements, Water quality benefits.

To evaluate the economic aspects of water quality literature was reviewed and results compiled. Chapter I contains approaches for analyzing and describing qualitative phenomena, the origins of water contaminants, and categorizes pollutants. Chapter II is devoted to a discussion of classifications and indices of water quality, water uses, effects and damages of water contamination, and water quality requirements and standards for specific uses. Water quality models are discussed in Chapter III. In many cases the purpose of models is to permit planners to determine the probable effectiveness of alternative water quality allocation or enhancement measures. Chapter IV is devoted to the technology and cost of water supply purification while Chapter V is concerned with the technology and cost of waste and receiving-water purification. Chapter VI discusses water quality benefit measurement as based on two major methods: willingness-to-pay and substitution of alternative cost. Chapter VII reviews the economic techniques for optimal water supply purification and allocation and Chapter VIII considers economic techniques for the optimal sol

tion of the pollution problem. Four problems are specifically discussed: waste disposal, effluent charges and control, receiving water quality management, and optimal waste treatment. (Auen-Wisconsin).
W76-05818

MEASURING AND MINIMIZING THE SOCIAL COST OF ENVIRONMENTAL POLLUTION,
Tennessee Univ., Knoxville. Center for Business and Economic Research.
C. B. Garrison, and H. W. Henry.
Available from the National Technical Information Service, Springfield, Va 22161, as N74-22591, $4.00 in paper copy, $2.25 in microfiche. Report NASA CR-138118, January 1973. 85 p, 11 tab, 10 append. UT/NASA 43-001-021.

Descriptors: *Pollution abatement, *Industries, *Administrative decisions, *Economic impact, Industrial production, Costs, Water pollution, Air pollution, Measurement, Soil contamination, Legislation, Planning, Research and development, Return(Monetary), Investment, Pricing, Professional personnel, Social impact.
Identifiers: *Environmental protection.

Fifty-three large, privately-owned corporations and the Tennessee Valley Authority provided information on the impacts of environmental protection on their corporate plans and actions. Most of these companies were in the automobile, petroleum, chemical, paper, non-ferrous metals, steel, and electric utility industries. Approximately 80% of the respondents had established a formal policy on 'environmental protection' and most policies were formalized during 1967-1971. The average capital expenditure per firm was $14.8 million in 1971 and an estimated $21.9 million in 1972. Some plant shut downs were reported as well as additions and deletions to product lines. A large increase in research and development spending was reported as well as the formation of many new staff and executive positions. The profitability of many firms has been reduced, but few price increases had been made due to competitive pressures. There was unanimous opposition to zero pollution legislation. The respondents believed that many conservationists, legislators, and concerned citizens lack knowledge and perspective about the many impacts and considerations in controlling environmental pollution in industrial operations. Industrial managers, too, may not understand the full impact or the potential danger to the biosphere from combined effects of pollutants from many sources. The concensus was that pollution surveillance and control should be coordinated with involved local, state, and federal agencies. (Auen-Wisconsin).
W76-05824

TECHNIQUE FOR ENVIRONMENTAL DECISION MAKING USING QUANTIFIED SOCIAL AND AESTHETIC VALUES,
Battelle-Pacific Northwest Labs., Richland, Wash.
B. Burnham.
Report No. BNWL-1787 (UC-11), February 1974. 44 p. 54 fig., 23 tab., 26 ref.,5 append. AEC AT(45-1)1830

Descriptors: *Social values, *Aesthetics, Measurement, *Analytical techniques, Land use, Water quality, Biota, Air, Economics, Recreation, Public health, Safety, Nuclear power plants, Sites, Washington, Alternative planning, Correlation analysis, Regression analysis.
Identifiers: Seattle(Wash).

Correlation and regression analyses were used to combine social values with techno-economic values inherent in site selection based on six hypothetical nuclear power plant designs/site options and a set of rating scales for evaluating the acceptability of eight characteristics of each option in two different geographical locations. Eight social value criteria, including economics, water quality, air quality, animal/plant life, cultural/recreational, health/safety, aesthetics and land use, were used as weighting factors. The survey was administered to three Seattle population groups: environmentalists, high school students, and businessmen, and was designed to measure the respondents' direct weighting of the eight criteria by ranking each criteria in order of importance. The relative weights of the criteria were also measured indirectly by rating each (on a scale of one to seven) for each option and also making an overall judgment of the acceptability of each design option. A method was successfully developed to quantify aesthetics by fundamental equations expressing the relationships between viewscape quality and its basic components, and which is described in detail. The analyses indicated that near-maximum predictability could by achieved using as few as three of the eight impact categories as predictors of overall acceptability of the nuclear power plant. (Auen-Wisconsin)
W76-05825

WILLINGNESS TO PAY AS A BEHAVIOURIAL CRITERION FOR ENVIRONMENTAL DECISION-MAKING,
Waterloo Univ. (Ontario). Dept. of Man-Environment Studies.
D. W. Fischer.
Journal of Environmental Management, Vol. 3, No. 1, p. 29-41, 1975. 1 fig, 39 ref.

Descriptors: *Environment, *Decision making, *Social aspects, Social values, Methodology, Attitudes, Economics, Behavior, Market value, Pricing, Surveys, Pollution taxes(Charges).
Identifiers: *Environmental quality, Willingness-to-pay.

The economic nature of environmental quality questions and the inherent problems in the use of willingness-to-pay as a behavioral criterion for environmental managers is summarized. Development of an adequate theory or structure of social value which incorporates a variety of variables is necessary before attempting to apply economic techniques to environmental quality decisions, since environmental quality levels have little to do with market transactions or exchanges. Willingness-to-pay studies suffer from a lack of adequate information. Environmental damages are often perceived to be less than actually exist, and, in some cases, are concealed. Economic incentives for displaying, distorting, or hiding information also are important considerations, as is people's perceptions of their role in society. Willingness-to-pay evaluations ignore those who are not directly involved and those of future generations, both of which groups may have a strong demand for high environmental quality. Problems in determining actual individual preferences, and in the use of prices are also considered. The use of surveys in willingness-to-pay analysis are subject to the disparity between what people say and what they wilniques. (Luedtke-Wisconsin)
W76-05826

ENVIRONMENTAL IMPACT ASSESSMENT AS AN INSTRUMENT OF PUBLIC POLICY FOR CONTROLLING ECONOMIC GROWTH,
Waterloo Univ. (Ontario). Dept. of Man-Environment Studies.
For primary bibliographic entry see Field 6G.
W76-05828

PORT COLLECTION AND SEPARATION FACILITIES FOR OILY WASTES. VOL. 5. A COMPARATIVE ANALYSIS OF CONCEPTUAL SYSTEM PLANS FOR THE SURVEYED PORTS UNDER THE 'NO DISCHARGE', '1969 AMENDMENTS' AND 'NO SHEEN' CRITERIA,
Harris (Frederick R.), Inc., New York.
For primary bibliographic entry see Field 5D.
W76-05830

SALT TRANSPORT IN SOIL PROFILES WITH APPLICATION TO IRRIGATION RETURN FLOW, THE DISSOLUTION AND TRANSPORT OF GYPSUM IN SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W76-05836

RESTORING THE QUALITY OF URBAN RECEIVING WATERS: INTERFACING UPGRADED TREATMENT FACILITIES WITH THE STREAM,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W76-05839

MULTI-OBJECTIVE WATER RESOURCES PLANNING: METHODOLOGY TO ACHIEVE COMPATIBILITY BETWEEN ENVIRONMENTAL AMENITIES AND ECONOMIC DEVELOPMENT,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 6B.
W76-05840

IMPACTS OF HYDROLOGIC MODIFICATION ON WATER QUALITY,
MITRE Corp., McLean, Va.
J. Bhutani, R. Holberger, W. E. Jacobsen, P. Spewak, and J. B. Truett.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 523, $13.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/2-75-007, April 1975, 530 p. EPA 1BB042 R802310.

Descriptors: Sedimentation, *Sediment control, Water quality, Runoff, Hydrology, *Water pollution control, *Construction, Impoundments, *Dredging, Forecasting, Reservoirs, *Sediment load, Suspended load.
Identifiers: Soil loss.

The scope and magnitude of water pollution problems caused by hydrologic modifications (dams, impoundments, channelization, in-water construction, out-of-water construction, and dredging) are described. Types of pollutants released by each class of hydrologic modification are identified, and quantitative estimates are made of the amount of the major pollutant--sediment--that enters the Nation's surface waters as a result of highway and urban construction. Methods for controlling the release of pollutants from hydrologic modification activities are described, and the effectiveness of sediment control measures is estimated. Two 'loading functions' are developed for predicting the quantities of sediment released from construction operations of given magnitude and location. These functions are based on measurements of sediment yields and other parameters at 10 construction sites. The accuracy and limitations of the functions are analyzed. Measurement data from all classes of hydrologic modifications are reported in the 42 case studies of field projects summarized in the appendices. (EPA)
W76-05866

INTERIM REPORT ON THE IMPACT OF PUBLIC LAW 92-500 ON MUNICIPAL POLLUTION CONTROL TECHNOLOGY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-05867

RECLAMATION OF SOILS CONTAMINATED WITH RADIOACTIVE STRONTIUM,
Agricultural Research Service, Beltsville, Md.
J. V. Lagerwerff, and W. D. Kemper.

Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1077-1080, November-December 1975. 3 fig, 3 tab, 13 ref.

Descriptors: *Land reclamation, *Strontium radioisotopes, *Leaching, *Radioactivity, *Soil contamination, Reclamation, Fallout, Radiochemical analysis, Environmental effects, Leachate, Radioactivity techniques, Chemical analysis, Analytical techniques, Soil management, Gypsum, Dispersion, Tracking techniques, Pollutants, Pollution abatement, Colorado, Soil treatment.
Identifiers: *Radioactive strontium, Residual strontium, Specific adsorption, Agricultural soils, Evesboro loamy sand, Sassafras sandy loam, Fort Collins silt loam, Tagged soil, Strontium displacement, Exchange capacities.

Evesboro loamy sand, Sassafras sandy loam, and Fort Collins silt loam were treated with a mixed Ca-Sr solution to give about 95% saturation with Ca and 5% saturation with Sr. Samples of these soils were placed in acrylic cylinders and leached with 0.06N CaC12 to remove Sr. The leachings were mechanically controlled at various rates for different periods of time. Extracting the leached soil samples with 1N HC1 yielded residual Sr equal to 0.43, 0.47, and 0% of the Sr exchange capacity of the Evesboro, Sassafras, and Fort Collins soils, respectively. There was general agreement between Sr concentrations measured at various depths and those calculated on the basis of the Lapidus-Amundson equation, especially so with heavier soils. The Evesboro and Fort Collins soils were also tagged with carrier-free Sr85 and, mounted in columns, leached with 0.06N solutions of either CaC12 or SrC12. The removal of Sr85 was more complete from the Evesboro than from the Fort Collins soil, and from the center than from the edge of the columns. Short-term leaching capability of SrC12 exceeded that of CaC12 where Sr85 was present in amounts small enough to be adsorbed mostly on specific soil adsorption sites. Where larger amounts of Sr85 had been adsorbed, Ca was equally effective as Sr in replacing the contaminant. (Henley-ISWS)
W76-05906

EFFECT OF SURFACE APPLIED SULFURIC ACID ON WATER PENETRATION INTO DRY CALCAREOUS AND SODIC SOILS,
Arizona Univ., Tuscon. Dept. of Soils, Water and Engineering.
T. A. Yahia, S. Miyamoto, and J. L. Stroehlein.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1201-1204, November-December 1975. 3 fig, 4 tab, 8 ref.

Descriptors: *Soil treatment, *Calcareous soils, *Revegetation, *Infiltration, Penetration, Sulfur compounds, *Southwest U.S., Gypsum,, Dispersion, Percolation, Soils, Calcium carbonate, Surface waters, Vegetation regrowth, Range management, Chemical wastes, Irrigation practices, Chemicals, Physical properties, Soil amendments, Acids, Alkaline soils, Reclamation, Soil structure, Soil moisture.
Identifiers: Range soils, Water penetration, *Sulfuric acid, *Acid treatment(Soils), Sodium saturated soils, Salt content, Playa soils, Stewart soils, Surface application, Soil particles.

Sulfuric acid, a surplus by-product of copper smelters in the Southwest, was studied to determine a possible role in reclamation and revegetation of calcareous and sodic range soils. The rate of water penetration into dry calcareous soils was measured in columns as well as boxes after concentrated (93%) sulfuric acid was applied to the soil surfaces. The rate of penetration increased with increasing acid application rates, but then decreased, with optimum application rates ranging from 5 to 15 metric tons/ha. Acid was especially effective in increasing the rate of penetration into sodium-affected calcareous soils. When acid was applied as a band on the soil surface, the wetting front advanced in an elongated semicircular form with depth. Surface applied acid was more effective than surface applied gypsum in increasing water penetration into sodium-saturated soils. Sulfuric acid may be useful for increasing water penetration into and subsequently aiding in revegetation of sodium-affected soils of semi-arid regions. (Henley - ISWS)
W76-05907

THE ECONOMICS OF CLEAN WATER. VOLUME III. INDUSTRY EXPENDITURES FOR WATER POLLUTION ABATEMENT.
Conference Board, Inc., New York.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-231 147 $5.50 in paper copy, $2.25 in microfiche. EPA Report January 1972. 112 p. 74 tab., 5 append. 14-12-844.

Descriptors: *Industrial wastes, *Water pollution control, *Costs, *Industries, Capital costs, Operating costs, Projections, Waste water treatment, Facilities, Sewage treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Hydrogen ion concentration, Heated water, Effluents, Geographical regions, Annual costs.

The efforts made to abate pollution by the food, textile, paper, chemicals, petroleum, rubber and plastics, and primary metals industries (which accounted for 92.3% of the water used and discharged in 1968 by all manufacturers) are defined by their expenditures for physical facilities, for operation, and the number of employees assigned to operate the treatment facilities. For the 1965-1969 period, 63% of the plants indicated that the greatest portion of expenditures was for construction of treatment facilities and only a small portion spent toward revising manufacturing processes. The expenditures made over the period represented at 4.4% radtio of gross capital investment for small plants and less than 1% for the largest establishments. The annual charge for pollution abatement represented a ratio to the cost of materials or the value of shipments of under 1%. The reported daily discharge was 7.8 billion gallons of wastewater of which 92.9% of the total volume was discharged directly to surface waters and 5.0% flowed into public sewers, and required payment at the rate of $91 per million gallons discharged wastewater. Inplant treatment represented a mean operation cost per volume of wastewater of $73 per million gallons. Industry expenditures for the next five years are expected to double. (Auen-Wisconsin)
W76-05951

PROCESS FOR SEPARATING OIL FROM EMULSIONS OF OIL IN WATER,
For primary bibliographic entry see Field 5D.
W76-05964

APPARATUS FOR COLLECTING SURFACE PARTICLE ON BODY OF WATER,
L. Carter.
U.S. Patent No. 3,931,740, 4 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 942, No 2, p 710, January 13, 1976.

Descriptors: *Patents, *Water pollution, *Floating, *Sampling, *Water sampling, *Skimming, Water pollution sources, Water quality, Flotsam, Air-water interfaces, Separation techniques.
Identifiers: Floating particulates, Hydrofoils, Sails.

An apparatus for sampling and collecting floating particulate matter on the surface of a body of water has parallel, laterally-spaced, longitudinal tracking floats supporting a rigid tubular frame. Secured to the frame are two parallel, horizontal hydrofoil bodies spaces apart from each other to form an intake opening. A funnel-shaped net with its wide end secured to the intake opening and its narrow end terminating in a collecting screen collects surface particulate matter which is caused to flow into the intake opening as the apparatus is towed on a body of water. The lower hydrofoil body maintains the intake opening at a predetermined depth below the water surface, while the upper hydrofoil body enables the apparatus to ride over swells. In an alternative embodiment, a canvas sail is placed above the net to form an air capturing pouch which provides a lifting force to lift and maintain the net in an attitude generally parallel to the water surface. This attitude maintenance permits the skimming of a relatively thin layer of surface water and floating matter from the bulk water below. (Sinha - OEIS)
W76-05970

REMOVAL OF IMMISCIBLE FLUIDS FROM WATER SURFACES AND LAKE BEDS,
Electrolysis Pollution Control Inc., Minneapolis, Minn. (Assignee).
C. E. Peterson.
U.S. Patent No. 3,933,632, 5 p, 8 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1344, January 20, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, *Water pollution control, *Water quality control, Adsorption, Iron oxides, Aluminium, Magnesium, Skimming.
Identifiers: Mineral wool, Hydrophobic film, Natural stone

The invention provides for the removal of immiscible fluids by placing an adsorbant compound on the surface of the water. The adsorbant compound is an admixture of compacted lead slag mineral wool coated with a hydrophobic oil soluble film such as oleic acid, and between about 30% and 70% by weight of a finely divided natural stone containing substantial quantities of the oxides of iron, aluminum and magnesium such as trap rock, basalt or gabbro. The composition of the adsorbant compound is one which does not contribute to biological oxygen demand in the water being treated. The substances are highly inert, and are utilized for their highly adsorbant characteristics. The rate of adsorption is high, and the retention of adsorbed oily materials has also been found to be unusually high. An oil slick may be removed from the surface of a body of water by broadcasting the adsorbant compound upon the surface of the water and the oil slick will remain tightly adsorbed by the material over extended periods of time. The net affect is a reduction in the extent of pollution of the body of water. The coated or treated mineral wool assists in maintaining the material buoyant over extended periods of time, however it may be desirable or expedient to permit the adsorbant material to remain on the water surface and permitted to ultimately settle to the bottom of the body of water while retaining the adsorbed pollutants. (Sinha - OEIS)
W76-05984

RECOVERING BITUMEN FROM LARGE WATER SURFACES,
Great Canadian Oil Sands Ltd., Toronto (Ontario) (Assignee)
H. L. Erskine
U.S. Patent No. 3,933,651, 3 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1351, January 20, 1976.

Descriptors: *Patents, *Water pollution, Water pollution sources, *Water pollution treatment, Bituminous materials, *Separation techniques, *Oil wastes, Skimming, Application equipment.
Identifiers: Tar sands processing, Screen bottomed scoops.

The invention described is most useful in recovering floating bitumen from pond water from a hot water process for treating tar sands. In the

rocess a water effluent is removed from the hot rocessing area and is discharged into a setting ond. The water effluent comprises middlings aterial of depleted bitumen content which has ndergone final treatment, sand tailings layer and ther discharged water-containing fractions. The ffluent is discharged to the upper portion of a nd pile zone and it percolates through the sand nd collects in the pond. After standing a layer of ick bitumen collects as a thick scum at the pond rface. The apparatus recovering the bitumen is mprised of a continuous conveyor belt; means r continuously rotating the belt from recovery ea to discharge area; and screen bottomed oops spaced along the outer surface of the belt. operation the belt is set so that the scoops dip to the water at the recovery area immediately low the bitumen water interface. The belt is then t into operation. The scoops dip into the body of ater and carry water and bitumen up and away om the recovery area to a discharge area. As the lt passes between the areas, water drains rough the scoop screening to the belt surface. he belt crown directs the water to the belt edge here it can be collected by troughs or merely scharged off. The belt can be provided with baf-es to aid in deflecting the water sideward of the lt. (Sinha - OEIS)
76-05992

OLE OF PHENYLMERCURIC ACETATE ON TOMATAL REGULATION AND WATER LOSS N PROSOPIS CINERARIA LINN,
dhpur Univ. (India). Dept. of Botany.
Mathur.
eobios (Jodhpur). 1(2/3): 48-52. 1974.

escriptors: *Stomata, Regulation, Spraying, eaves, Transpiration, *Moisture deficit.
dentifiers: *Phenylmercuric acetate, *Prosopis-ineraria.

vestigations were carried out after the spray eatment with PMA (phenylmercuric acetate) and ater on the adult and young plants of P. cineraria ith regard to the stomatal regulation and con-quent water loss and absolute water content in e leaves. They were examined at different dura-ons after the above treatment. The water treated ung plants lost very much water as their stomata mained widely open but less was lost in the adult ant. The percentage of absolute moisture mained more in PMA treated plants, when com-red with water treated ones, as they transpired r more water than the former.--Copyright 1975, ological Abstracts, Inc.
76-06011

REEDING PLACES AND SEASONAL IN-DENCE OF AEDES AEGYPTI, AS ASSESSED Y THE SINGLE-LARVA SURVEY METHOD,
orld Health Organization, Dar es Salaam anzania). East African Aedes Research Unit.
machandra T. Rao, M. Trpis, J. D. Gillett, C. esdale, and R. J. Tonn.
ll W H O. 48(5): 615-622. 1973.

scriptors: *Seasonal, *Mosquitoes, *Breeding, sects, *Insect control, Rainfall.
ntifiers: Aedes-Aegypti, *Tanzania.

e single-larva survey method was employed to dy the breeding places and seasonal incidence A. aegypti in Dar es Salaam, Tanzania. From y 1968-May 1969, 28,462 containers of water--ated in approximately equal numbers indoors d outdoors-were investigated. The highest quency of breeding (8.0%) of A. aegyplti sobserved in tires and motor parts. Drums, bar-s, water-pots and other receptacles left out-ors showed a higher frequency (3.1%) than se kept indoors (0.6%). Metal containers were ested to a greater extent than those made of d, wood or other materials, 2.5% of coconut lls, snail shells, etc. and 1.3% of tree holes, nt axils, and cut bamboos were infested. The seasonal prevalence, expressed as a container index, closely followed and paralleled the fluctuations in rainfall. The value of this survey method for both ecological studies and practical control purposes is discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-06033

INFLUENCES OF SOME FRESHWATER PLANTS ON THE DEVELOPMENT AND SURVIVAL OF MOSQUITO LARVAE IN BRITISH COLUMBIA,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
P. D. C. Angerilli, and P. Beirne.
Can J Zool 52(7): 813-815. 1974.

Descriptors: *Canada, *Mosquitoes, Aquatic plants, *Algae, Larvae, Insect control, Chloroplyta.
Identifiers: Aedes-Aegypti, British Columbia, Callitriche-Palustris, Chara-Globularis, Elodea-Canadensis, Lemna-Minor, Nymphaea-Tuberosa, Utricularia-Minor.

Six species of freshwater aquatic plants and an alga (Chara globularis) (Characeae) collected in southern British Columbia (Canada) markedly reduced the number of adult mosquitoes (Aedes aegypti) emerging from experimental tanks by influencing larval development and survival. One of the plants (Lemna minor) and the green alga apparently produce juvenile hormone-like compounds, one species (Utricularia minor) ingests mosquito larvae, and two (Callitriche palustris and Nymphaea tuberosa) operate by facilitating the presence and activity of predators of the larvae. --Copyright 1974, Biological Abstracts, Inc.
W76-06048

THE INTERNATIONAL LAW ASPECTS OF THE GARRISON DIVERSION PROJECT,
For primary bibliographic entry see Field 6E.
W76-06053

CONGRESS ORDERS MORITORIUM ON GARRISON DIVERSION UNIT.
For primary bibliographic entry see Field 6E.
W76-06054

THE TAKING ISSUE: POTENTIAL OBSTACLE TO NATURAL RESOURCE MANAGEMENT LEGISLATION,
Oregon Univ., Eugene. School of Law.
For primary bibliographic entry see Field 6E.
W76-06055

THE WASHINGTON SHORELINE MANAGEMENT ACT,
Geoffrey Crooks.
Oregon Law Rev, Vol 54, No. 1, p. 35-65 (1975), 31 p.

Descriptors: *Water management(Applied), *Permits, *Washington, *Resources development, *Legislation, Legal aspects, State governments, Local governments, Water law, Water resources development, Management, Planning, Natural resources, Resource allocation, Water quality, Water quality control, Water policy, Administration, Comprehensive planning, Environmental effects, Constitutional law, Eminent domain.
Identifiers: *Washington Shoreline Management Act, *Coastal zone management, Coastal waters.

The Washington Shoreline Management Act (SMA) is one attempt to legislatively control the course of development of Washington's coastal resources. The SMA is unusually broad in scope in that it covers not only 'coastal areas' but also shorelines of various bodies of water, including many lakes and streams. Originally a substitute for a stricter law proposed by environmentalists, the SMA has created a regulatory scheme requiring an inventory of the state's shorelines and development of master programs designating the types of uses permissible for individual segments of those shorelines. To enforce its provisions the Act establishes a permit system requiring approval for many types of shoreline uses. Responsibility for enforcement of the Act rests primarily with local governments. The author sees potential constitutional problems with SMA's regulatory scheme in that a denial of a permit for the development of privately owned land may constitute an unconstitutional taking of that land. (Nursey-Florida)
W76-06056

COASTAL ZONE MANAGEMENT AND INTERGOVERNMENTAL COORDINATION,
Louisiana State Univ., Baton Rouge. Law School.
For primary bibliographic entry see Field 6E.
W76-06057

CORPS ISSUES INTERIM RULES FOR DISCHARGES OF DREDGED AND FILL MATERIALS.
Environmental Law Reporter, Vol 5, No 9, p. 10143-10144 (1975). 4 ref.

Descriptors: *Dredging, *Federal Water Pollution Control Act, *Water pollution control, *Permits, *Regulation, Legal aspects, Legislation, Judicial decisions, Water law, Law enforcement, Federal government, State governments, Water pollution, Water pollution sources, Water pollution abatement, Water quality, Water quality control, Wetlands, Navigable waters, Discharge(Water), Pollutants, Water resources, Water conservation.
Identifiers: Administrative regulations, *FWPCA Amendments of 1972.

Interim rules for discharges of dredged and fill materials adopted by the Army Corps of Engineers are examined here in light of a court order invalidating the previous rules and directing the Corps to shoulder its full regulatory responsibility under the Federal Water Pollution Control Amendments of 1972. While the rules are lengthy and complex, they establish a workable regulatory program for the protection of watercourses and wetlands from discharges of dredged and fill materials. Materials produced in normal farming, silviculture and ranching activities are specifically excluded from these rules. Because of budgeting and manpower constraints, the rules will be implemented in three phases over a two year period. When fully implemented, the rules will encompass all waters subject to the Corps jurisdiction. Under the new rules, the states are to play a significant role in the protection of wetlands and watercourses. Thus the Corps will not issue a permit if the state in which the discharge will occur denies a water quality certification for the activity. (Nursey-Florida)
W76-06061

ALASKA OIL POLLUTION REGULATIONS.
In: 1974 BNA Environmental Rep. 706: 0621-22 (Alas. Ad. Code (AAC), Title 18, Environ. Conserv., Ch. 75, 1973) 2 p.

Descriptors: *Permits, *Alaska, *Oil pollution, *Oil, *Water pollution, Waste water(Pollution), Water conservation, Water permits, Water pollution, Control, Water pollution sources, Water quality, Water quality control, Regulation, Legislation, Penalties(Legal), Legal aspects, State governments, Environmental control, Land, Soil conservation, Oil wastes.

The discharge of oil, asphalt, bitumen or residuary products of petroleum onto the lands of Alaska is herein prohibited unless a surface oiling permit has been obtained from the Department of Environmental Conservation. Persons attempting to stabilize soils with such petroleum products as tars, asphalt emulsions or oils are not exempt from the

surface oiling permit requirements. Construction of certain specified enumerated types of surfaces do not require a permit, provided that the construction of each surface does not result in the pollution of the land or waters of the state. Application for all such permits must be made on forms prescribed by the department, and the granting or denial of such a permit is decided by the department after all necessary information is filed. Specific permit terms and conditions are applicable to all permits granted, including the prohibition of any application of petroleum derived dust retardants to wet surfaces, and the prevention of any oil runoffs from the surface receiving the application. Penalties for any violations include both fines and/or imprisonment. (Welch-Florida)
W76-06062

STATE WATER QUALITY CONTROL FUND.
In: 1975 BNA Environmental Rep. 721:0505-09 (Calif. Water Code). 5 p.

Descriptors: *California, *Water quality control, Loans, *Water pollution control, *Financing, Cost repayment, Credit, Capital, Debt, Regulation, Administration, State governments, Administrative agencies, Reviews, Legal aspects, Construction, Construction costs, Contracts, Priorities, Projects, Water contracts, Water costs, Reclaimed water, Reclamation.
Identifiers: Administrative regulations, Water reclamation.

California has established a State Water Quality Control Fund to provide loans to public agencies to aid them in the construction of facilities for the collection, treatment or export of waste when necessary to prevent water pollution or for the reclamation of waste water and conveyance of reclaimed water. The State Water Resources Control Board herein outlines the application, processing and review procedures available to implement the utilization of the fund. Construction loans are available only upon a showing of a need of such loans to prevent pollution or where other monies are not available, and loans for up to one-half of the cost of studies made by the public agency in connection with waste water reclamation are available when the study will provide needed information and funds for such a study are otherwise unavailable. Representative sections of the regulation provide for: (1) loan contract conditions; (2) specified priorities of loan applications; and (3) review procedures by the state board of an action or failure to act by a regional board. The state board shall have power to issue subpoenas to require attendance of witnesses at such review hearings. (Welch-Florida)
W76-06063

WASTE DISCHARGE REPORTS AND REQUIREMENTS.
In: 1975 BNA Environmental Rep. 721:0519-27 (Calif. Water Code). 12 p. 1 tab.

Descriptors: *California, *Waste disposal, *Disposal, *Water pollution control, *Water permits, Water pollution sources, Waste water(Pollution), Treatment facilities, Administration, Administrative agencies, Waste water disposal, Waste water treatment, Wastes, Water quality standards, Water quality, Environmental control, Legal aspects, Protection, Water law.
Identifiers: Administrative regulations.

The California State Water Quality Control Board herein requires the filing of a report for every waste discharge or for a material change in a waste discharge previously filed and requires the payment of a filing fee. A material change includes any addition of a major industrial waste discharge, a change in character of such a discharge, or any circumstances resulting in a material change of character, amount, or location of waste discharge. Flow volumes are checked by monitoring program reports, time schedule requirements for existing discharges, and technical reports showing how excess volumes of effluent will be treated and disposed. Representative sections of the regulation provide for: (1) formulation of waste discharge requirements; (2) conditions and duration of waste discharge requirements; (3) monitoring, recording, and reporting of all orders containing waste discharge requirements; and (4) inspection to determine compliance. Cease and desist orders should be issued for any significant violation of waste discharge requirements or when any such violations are threatened. Furthermore, the discharger may be required to take appropriate remedial or preventive action. (Welch-Florida)
W76-06065

CERTIFICATION OF CONFORMANCE WITH WATER QUALITY STANDARDS.
In: 1975 BNA Environmental Rep. 721:0530-32 (Calif. Water Code). 3 p.

Descriptors: *Permits, *California, *Water quality standards, *Inter-agency cooperation, Navigable waters, Water quality control, Water quality, Environmental control, Regulation, Administrative agencies, Federal Water Pollution Control Act, Waste disposal, Water resourses, Legal aspects, Permits, Taxes, Waste water(Pollution), Federal-state water rights conflicts.
Identifiers: Administrative regulations, Licenses.

All applicants for federal licenses or permits, and other persons who are required by federal law to obtain state certification that any discharge into navigable waters of the United States complies with applicable provisions of the Federal Water Pollution Control Act, as amended, shall submit their requests for certification to a California State Water Quality Control Board regional office. The application must contain all necessary information upon which a decision could be made plus any additional waste discharge information requested by the regional office. The regional recommendation, along with the information, must then be forwarded to the state board where a public hearing will be held if any activity poses a significant threat to the quality of navigable waters or where requested by the applicant. The executive officer of the state board will act upon the certification and provide a copy of the application and his recommendation to the regional office of the Environmental Protection Agency (EPA). Furthermore, any application for certification by taxpayers who elect to take the deduction for amortization of water pollution control facilities under section 169 of the Internal Revenue Code of 1954, as amended, shall likewise be submitted to the regional EPA office through the state board. (Welch-Florida)
W76-06066

MICHIGAN WASTEWATER REPORTING AND SURVEILLANCE FEES RULES.
Michigan Dept. of Natural Resources E. Lansing. Water Resources Commission.
In: 1974 BNA Environmental Rep. 811:0541-43 (Mich Ad Code Part 9 1972, amended 1973). 3 p.

Descriptors: *Adoption of practices, *Michigan, *Waste water disposal, *Sewage, Administrative decisions, Water resources, Organic compounds, Inorganic compounds, Elements(Chemical), Oil, Salts, Gasoline, Sludge, Discharege(Water), Pipes, Conduits, Cooling water, Surface waters, Lakes, Rivers, Streams, Great Lakes, Permits.

Michigan has adopted rules governing 'Wastewater Reporting and Surveillance Fees.' Under these rules a register of critical materials as initially compiled by the state water resources commission was to be published during October, 1971 with annual reports to be filed with the commission by every person doing business within the state who either discharges wastewater into the waters of the state, or who discharges wastewater in addition to sanitary sewage into a sewage system. Furthermore, an interim report shall be filed if the use of critical material not previously reported is commenced during the year, or the amounts of critical materials discharged increase sufficiently to move the level of usuage into a higher category on the annual critical materials report. A person doing business in more than one location shall file a separate report for each location. Finally, the rules provide for an annual surveillance fee of not more than $9,000 for each industrial or commercial location, such fees to be calculated and assessed according to this act. A person who contests a fee shall be afforded opportunity for a hearing thereon. (Segall-Florida)
W76-06067

MICHIGAN WATER RESOURCES COMMISSION ACT.
In: 1973 BNA Environmental Rep 811:0101-0 (Act 245, Mich Pub Acts of 1929, as amended 1973). 5 p.

Descriptors: *Permits, *Michigan, Wate resources, *Water quality control, *Water pollu tion control, Water pollution, Great Lakes, Floo plains, Rivers, Streams, Discharge(Water), Flood ways, Water quality, Water quality standards Surface waters, Investigations, Flood control Construction, Beach erosion, Obstruction to flow Public health, Fish, Waste treatment, Ground water, Sewage.

Michigan has enacted legislation establishing water resources commission to protect and con serve the water resources of the state and to hav control over all pollution of state waters. The com mission may bring any appropriate action in th name of the people of the state to carry out th provisions of this act. The commission has th right to inspect any property for conditions th may cause pollution of state waters, and t establish pollution standards. In addition the com mission has authority to control and regulate th use of flood plains. The legislation also sets fort rules and regulations concerning the discharge liquid wastes into state waters. Provisions for pe mit issuance and for conducting hearings on a leged unlawful pollution of state waters are s forth. Any person who discharges any substanc into the waters of the state in violation of this act subject to fine. Finally, an annual surveillance f is payable by any person or corporation dischar ing water borne into any waters of the sta (Segall-Florida)
W76-06068

REGULATIONS PERTAINING TO WAST DISCHARGE PERMITS.
In: 1975 BNA Environmental Rep. 886:0527- (Ore. Ad. Rules Compilation Sects. 45-005 thru 4 065). 4 p.

Descriptors: *Water quality standards, *Oregc *Waste treatment, *Waste water dispos *Permits, Effluents, Sewage disposal, Municip wastes, Industrial wastes, Waste water treatme Water quality control, Wastes, Regulation, A ministrative agencies, Administration, Adopti of practices, State governments.
Identifiers: Public hearings, *National Polluti Discharge Elimination System (NPDES) perm Public notice.

To enhance the quality of Oregon waters, all p sons must obtain a permit before they discha municipal or industrial wastes into state wate construct or alter a disposal system, discha wastes from an existing disposal system, or c struct any facility which would increase efflu discharges. Such state permits will not required, however, if the person has already tained a valid National Pollutant Discha Elimination System (NPDES) permit. Despite t permit system, the regulation lists several types wastes which may not be discharged into st waters under any circumstance. When a state p

nit is desired, the person is first referred to nother chapter of the statute for the procedural equirements in obtaining the permit. These regu- ations present the procedural steps and require- nents pertaining to the application for, issuance nd revocation of a NPDES permit. Before any inal determination is made concerning permit is- uance, a tentative NPDES permit, listing effluent mitations, schedules of compliance and other pecial conditions, must be prepared for public issemination. After allowing the public 30 days to ake any comments, the final decision on the per- nit issuance may be made. (Hoffman-Florida) W76-06069

EPOSIT OF MOTOR VEHICLE BODIES AND CCESSORIES INTO THE WATERS OF THE TATE.

n: 1975 BNA Environmental Rep. 886:0530-31 Ore. Regs. Secs. 46-005 thru 46-035, 1970). 2 p.

escriptors: *Permits, *Oregon, *Environmental ontrol, *Environment effects, *Waste disposal, il, Fuels, Chemicals, Penalties(Legal), Water ollution sources, Streams, State governments, dministrative decisions, Water quality stan- ards, Regulation, Legislation.
dentifiers: Motor vehicle deposits, Glass isposal.

efore any motor vehicle bodies or parts are eposited into Oregon waters, a permit must be btained from the Department of Environmental uality. The application for this permit must con- in the following information: (1) the name and ddress of the applicant; (2) the number of motor ehicle bodies or parts to be deposited; (3) the pur- ose and necessity for the deposit; (4) the name nd location of the receiving body of water; and 5) the time schedule and method for the deposit of ie vehicles. To protect the quality of state waters, ny vehicles allowed to be deposited must be rained of all oil, fuel, chemicals and other poten- al pollutants. In addition, all glass and windows ust be removed. Besides these minimum require- ents, steps must also be taken to provide an esthetically compatible finished appearance after ie vehicles have been completely covered and dequately secured. To assure the enforcement of ese provisions, criminal penalties are provided r any violations. (Hoffman-Florida) 76-06070

EGULATIONS PERTAINING TO OIL SPILLS TO PUBLIC WATERS.

: 1975 BNA Environmental Rep. 886:0531-32 Ore. Regs. Sec. 47-005 thru 47-030, 1972). 2 p.

escriptors: *Cleaning, *Adoption of practices, Oregon, *Oil spills, *Oil pollution, Water pollu- on sources, Penalties(Legal), Chemical, Water ality control, Water pollution, Disasters, Oily ater, Environmental effects, State government, egislation, Regulation.
entifiers: *Oil spill clean-up.

o protect the quality of state waters, Oregon has aced affirmative duties on any person having ntrol over oil that is spilled into public waters. ie person must immediately take steps to stop illing, and must then proceed to collect and move the oil. If collection of the oil is not feasi- e the person must take all practicable actions to ntain, treat or disperse the oil. When proceeding th such actions, approval must be obtained from e Department of Environmental Quality before y chemical is used to aid in the cleanup. Any ps taken to control or collect the spill must be igently carried outuntil the Department gives itten notice that satisfactory cleanup is ieved. In addition to these duties, the person ist submit to the Department within seven days the spill a full report describing the spill and the ps taken to avoid a recurrence. If the spill is ermined to have been caused by the intentional negligent conduct of the person having control over the oil, he shall be liable for a civil penalty of up to $20,000. (Hoffman-Florida) W76-06071

CONFINED ANIMAL FEEDING OR HOLDING OPERATIONS.

In: 1975 BNA Environmental Rep. 886:0532-35 (Ore. Regs. Secs. 51-005 thru 51-080, 1972). 4 p.

Descriptors: *Permits, *Oregon, *Confinement pens, *Domestic animals, Waste treatment, *Farm wastes, Farm management, Water pollution sources, Administrative agencies, Storage capacity, Drainage, Waste disposal, Engineering personnel, Water quality control, Climatology, State government, Federal governments.
Identifiers: Animal waste control facilities.

To protect the quality of the environment, any person planning to construct or operate a confined feeding or holding operation must receive approval for the proposed facility or operation from the Department of Environmental Quality. Any plan submitted for approval must contain information pertaining to location climatological data, the maximum number and types of animals to be confined, and several other specified factors. No approval will be given to plans which will result in the discharge of wastes into state waters without a permit. To provide specialized expertise to the Council on a number of problems related to confined feeding or holding operations, a thirteen member advisory board is created which will include one member each from thirteen specified groups or organizations. These regulations also provide guidelines on a number of different factors involved in the design including: drainage and waste volume control, collection and storage facilities, conveyance facilities and practices, disposal facilities and practices, and incidental control practices. When any of the above waste control facilities are sufficiently complex, the Department may require that detailed plans be prepared by a qualified engineer. Twelve different sources for such specialized design services are presented. (Hoffman-Florida) W76-06072

STATE FINANCIAL ASSISTANCE TO PUBLIC AGENCIES FOR POLLUTION CONTROL FACILITIES.

In: 1973 BNA Environmental Rep. 886:0535-37 (Ore. Regs. Secs. 81-005 thru 81-050, 1971). 3 p.

Descriptors: *Oregon, *Costs, *Government finance, *Water pollution control, *Financing, Treatment facilities, Economics, Bond issues, Sewage treatment, Rates, Permits, Loans, Cost repayment, Capital supply, Administrative agencies, Legislation.

To encourage the construction of water pollution control facilities, financial assistance from the state may be available for eligible projects. Reference is made to another Oregon regulation for a determination of what constitutes an eligible project. This regulation does define, however, what shall constitute eligible costs for control facilities. Any person desiring financial assistance must submit an application to the Department of Environment Quality which should include the following documents: (1) a current Environmental Protection Agency federal sewage treatment works construction grant application form; (2) a resolution of the applicant governing body authorizing an agent to act on its behalf; (3) a five year projection of the applicants estimated revenues and expenses; (4) a resolution of the applicant's governing body establishing sewer user rates for the facilities to be constructed; (5) a legal opinion by the applicant's attorney concerning the applicant's authorization to enter into a loan or bond purchase agreement. Factors to be considered by the Department when reviewing the application are set forth. If the application is approved, the Department may enter into a loan or bond purchase agreement in a principle amount not to exceed 70% of the eligible project cost. Detailed information pertaining to this agreement is presented. (Hoffman-Florida) W76-06073

SOUTH DAKOTA WATER POLLUTION LAW.

In: 1974 BNA Environmental Rep. 911:0101-10 (South Dakota Compiled Laws, Ch. 46-25, 1973 and H. B. 567, Laws, 1974). 11 p.

Descriptors: *South Dakota, *Water quality control, *Waste treatment, *Water quality standard, *Permit, Classification, State governments, Administrative agencies, Discharge(Water), Toxins, Oil spills, Water pollution control, Wastes, Domestic water, Monitoring, Water permits, Penalties(Legal).

In order to prevent the adverse effects of water pollution, positive steps will be taken by South Dakota authorities to protect and maintain a high quality of water for domestic, agricultural and other uses. As a first step in achieving these goals, the Board of Environmental Protection shall classify all state waters and shall promulgate applicable water quality standards. The Board shall also establish minimum requirements concerning the treatment of wastes. To insure that these requirements are met, a permit must be obtained before any wastes may be lawfully discharged into state waters. The procedural requirements pertaining to the application for, issuance and revocation of such permits are set forth. Notwithstanding any permit, a list of toxic and dangerous discharges is presented which may not be discharged under any circumstances. If a permit is obtained, the Board retains the right to take prescribed steps to assure compliance with the permit requirements. These statutes also present provisions on a number of different topics including: the cleanup procedure for oils spilled into state waters, the procedural requirements in dealing with violations, the powers required for waste treatment management agencies, and state grants for water pollution control facilities. (Hoffman-Florida) W76-06074

SOUTH DAKOTA ENVIRONMENTAL POLICY ACT.

In: 1974 BNA Environmental Rep. 911:0201-02 (South Dakota Environmental Policy Act, 1974). 2 p.

Descriptors: *South Dakota, *Environmental effects, Environmental control, *Alternative planning, *Legislation, Natural resources, Water resources development, Projects, Administration, Administrative agencies, Planning, Decision making, Adoption of practices, Ecology, Public health, State governments.
Identifiers: *Environmental Impact Statements, Public hearings.

South Dakota has enacted legislation to regulate water quality and to require impact statements. Before any agency approves a major action which may have a significant effect on the environment, it must prepare an environmental impact statement (EIS). This statement shall include the following information about the proposed action: (1) its description and environmental setting; (2) its short term and long term environmental effects; (3) its adverse effects which cannot be avoided; (4) any possible alternatine; (5) any irreversible commitments of resources which involve; (6) measures that could be taken to minimize adverse environmental effects; and (7) any growth-inducing aspects. The statement must also contain substantive comments received by the agency from the public concerning the proposed action. These comments will generally be in response to the draft EIS which must be prepared to give the public early notice of any proposed action. While the draft EIS need not be as detailed as the final EIS, it should follow the same basic format. Once the

final EIS has been prepared, it must be made available to the public for a specified time before any final decision is made. If the proposed action receives final approval, the approving agency must make an explicit finding that all the provisions of this Act have been met. (Hoffman-Florida)
W76-06075

SOUTH DAKOTA WATER QUALITY STANDARDS.
In: 1975 BNA Environmental Rep 911:0501-16 (Rules of Bd. of Environmental Protection; Art 34:04, Chs 34:04:02 thru 34:04:04, 1974). 16 p.

Descriptors: *Beneficial use, *South Dakota, *Water quality standards, *Waste water disposal, *Discharge(Water), Pollutants, Classification, Streams, Lakes, Toxins, Dissolved oxygen, Nitrates, Turbidity, Temperature, Suspended solids, Chlorine, Coliforms, Hydrogen ion concentration.
Identifiers: *Mixing zone.

To insure the quality of South Dakota waters, no pollutant may be discharged into a stream or lake if it will violate the beneficial use criteria of the receiving body. When testing these water bodies to insure compliance with prescribed criteria, discharges into a flowing water will be allowed a mixing zone. The minimum water quality standards for these mixing zones are set forth. Discharges into a lake, however, will not be entitled to a mixing zone. Regardless of the above provisions, no visible pollutants or toxic materials may be discharged into a lake or stream unless specifically authorized. When waters have been classified in one of eleven prescribed beneficial use classifications, steps must be taken to assure that the water body meets the water quality criteria of its classification. These criteria pertain to the following: total dissolved solids; nitrates; hydrogen ion concentration; coliforms; total chlorine residual; ammonia nitrogen; chlorides; total cyanide; free cyanide; dissolved oxygen; turbidity; temperature; suspended solids; total iron; and undisassociated hydrogen sulfide. Finally, all state streams aand lakes are assigned a beneficial use classification. (Hoffman-Florida)
W76-06076

UTAH WATER POLLUTION CONTROL ACT.
In: 1974 BNA Environmental Rep. 926:0101-04 (Utah Code Ann, 1953, Title 73, Ch 14, as amended by Ch 197, Laws, 1969; amended 1973). 4 p.

Descriptors: *Utah, *Water pollution control, *Water quality standards, *Permits, *Administrative agencies, Control, Abatement, Water pollution treatment, Waste disposal, Treatment facilities, Classification, Legislation, Legal aspects, Legal review, State governments, Waste treatment, Public health, Administration, Water types.

Because of the public menace presented by water pollution, a water pollution committee has been created within the Utah division of health. To aid in the establishment of a comprehensive water pollution control program, the committee is granted numerous powers and duties, the most important of which include: the authority to classify state waters according to reasonable uses; the authority to establish state water quality standards; and the authority to exercise control over all waste disposal permit systems. These waste disposal permits will be required whenever individuals propose the construction, installation, modification or operation of any treatment works or other establishment which will result in the discharge of wastes into state waters. The procedural requirements relating to the issuance, denial, or revocation of these permits are set forth. Procedural requirements are also set forth concerning any actions taken by the committee pertaining to the promulgation of water quality standards and the classification of state waters. Any individual who is adversely affected by any final decision of the committee may appeal to the appropriate district court. A further appeal may be taken to the state Supreme Court by any party to the action. (Hoffman-Florida)
W76-06077

UTAH DEFINITIONS AND GENERAL REQUIREMENTS.
In: 1973 BNA Environmental Rep. 926:0501-03 (Code of Waste Disposal Regs. Utah State Dept. of Health, Part 1, 1965). 3 p.

Descriptors: *Utah, *Water quality control, *Waste water disposal, *Monitoring, *Permits, Design data, Effluents, Surface waters, Groundwater, Waste treatment, Irrigation water, Domestic water, Waste water, Treatment facilities, Water pollution, Water treatment, Chlorination.

To prevent wastes from being detrimental or hazardous to surface or ground water quality, all waste disposal systems must produce an effluent meeting specified quality requirements. Reference is made to another Utah statute for a full description of these quality requirements. To insure compliance with the above provisions, the operator of the disposal system must keep daily records of the facility's operation to be submitted to the Utah State Division of Health at monthly intervals. The statute also requires that a permit be obtained before any person constructs a device for the treatment or discharge of wastewater, except into an existing sewer system. A permit is also required for the construction of any individual wastewater system. Before these permits will be issued, the applicant must submit to the Division complete plans and specifications for the proposed construction. To provide maximum utilization of all resources, class 'D' effluents from these wastewater systems may be used for ridge or furrow irrigation of forage type crops, ridge or furrow irrigation of lawn areas not open to public access, water for hosing down wastewater treatment works equipment, and chlorinator injector water for wastewater chlorination facilities. Utilization of domestic wastewater sledge is also anticipated, although such utilization is subject to specified restrictions. (Hoffman-Florida)
W76-06078

NEBRASKA LIVESTOCK WASTE CONTROL REGULATIONS.
In: 1975 BNA Environmental Rep. 836:0581-84 (Neb. Rules and Regs. Pertaining to Livestock Waste Control, Rules 1 through 11, 1974 as amended 1975). 4 p.

Descriptors: *Nebraska, *Farm wastes, *Water quality standards, *Livestock, *Treatment facilities, Waste treatment, Water pollution, Water treatment, Permits, Farm management, Waste disposal, Inspection, Legislation, Water pollution sources, Odor, Administration, Adoption of practices.

To enhance the quality of the state's environment, Nebraska promulgated these regulations to prevent the improper management of livestock wastes. To achieve this goal, all existing and proposed livestock operations must obtain a state construction permit and a NPDES permit whenever livestock wastes are discharged into state waters. Even if the wastes are not discharged into state waters, a state permit must be obtained if the discharged wastes create a nuisance, violate Nebraska Water Quality Standards, or violate the Nebraska Environmental Protection Act. The procedural steps and requirements pertaining to the application for, issuance and revocation of these permits are presented. Whenever a state construction permit is required, the operator must install livestock waste control facilities which hahave the approval of the Nebraska Department of Environmental Control. The type of facility which will be required largely depends on whether the facility will serve an open lot operation or a semi or totally housed operation. Once the facility has been approved, the operator is required to take specified steps to assure that all waste materials are properly disposed of, to assure the curtailment of odors, and to assure that no other pollution problems are created. Finally, the regulations provide for the periodic inspection control facilities. Hoffmaan-Florida)
W76-06079

TO AMEND THE WILD AND SCENIC RIVERS ACT (ON S. 10 AND S. 1004).
For primary bibliographic entry see Field 6E.
W76-06081

DESIGNATION AND DETERMINATION OF REMOVABILITY OF HAZARDOUS SUBSTANCES FROM WATER.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 39, No. 164, p. 30465-30471, August 22, 1974.

Descriptors: *Environmental effects, *Administrative agencies, *Water pollution, Legal aspects, Federal government, United States, Navigable waters, Regulation, Water quality, Penalties(Legal), Water pollution control, Water pollution treatment, Water quality control, Pollutants, Pollutant identification, Water pollution effects, Toxicity, Chemical wastes, Water law.
Identifiers: *Hazardous substances, Federal Water Pollution Control Act(FWPCA) Amendments of 1972, Administrative regulations, Coastal waters, Contiguous zone.

Pursuant to the Federal Water Pollution Control Act Amendments of 1972, the Environmental Protection Agency hereby gives notice of intent to create new rules for the designation and determination of removability of hazardous substances from water. The Administrator shall develop regulations designating as hazardous substances substances which present an imminent danger to the public health when discharged into water. To be considered for designation as a hazardous substance, a reasonable potential for being spilled into a body of water must be present. In determining whether a hazardous substance may 'actually be removed' from the water, the substance must be normally removable from a body of water by physical, chemical or biological means. The fact that some other action may be possible to 'minimize or mitigate damages to the public health' does not make the substance 'actually removable' for purposes of these rules. Should it be determined that a substance is not 'actually removable', discharges of that substance may be subject to civil penalties.
W76-06084

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 39, No. 166, p. 30891-30909, August 26, 1974. 13 p.

Descriptors: *Environmental effects, *Administrative agencies, *Lumber, Industries, Water pollution, Legal aspects, Water law, Federal government, Regulation, Water quality, Water pollution control, Water quality control, Water pollution treatment, Pollutants, Effluents, Water pollution sources, Saw mills, Economic impact, Technology, Control systems.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, Administrative regulations, Effluent limitations.

The Environmental Protection Agency hereby proposes effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources for the timber products processing point source category. The proposed regulation will amend present regulations by adding the wet storage subcategory, the finishing subcategory, the log washing subcategory, the sawmills and planing mills subcategory, the particle board manufacturing subcategory, and the insulation board manufacturing subcategory. The regulation requires that existing point sources achieve, by not later than July 1, 1977, effluent limitations which reflect the application of the best practicable control technology currently available. It also requires the achievement, by not later than July 1, 1983, of effluent limitations which represent the application of the best available, economically achievable, technology which will result in reasonable progress toward the national goal of eliminating all discharge of pollutants. New point sources must attain a Federal standard of performance which reflects the greatest degree of effluent reduction achievable through the best available control technology, including a standard permitting no discharge of pollutants, where practicable. (Nursey-Florida)
W76-06085

PLASTICS AND SYNTHETICS POINT SOURCE CATEGORY (PROPOSED EFFLUENT LIMITATIONS AND GUIDELINES).
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 39, No. 184, Part II, p. 33889-33908, Sept. 20, 1974.

Descriptors: *Classification, *Resins, *Regulation, *Water pollution control, *Plastics, Effluents, Legal aspects, Federal government, Legislation, Water law, Economics, Public health, Wastes, Water pollution, Water pollution sources, Water pollution abatement, Water quality control, Industrial wastes, Technology, Federal Water Pollution Control Act, Wastes, Resins, Polymers.
Identifiers: Administrative regulations, Federal Water Pollution Control Act (FWPCA) Amendments of 1972.

The Environmental Protection Agency has given notice of proposed effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources for the plastics and synthetics manufacturing point source category. The proposed regulation will amend 40 CFR (the Act), Part 416 by adding the ethylene vinyl acetate copolymers subcategory, the fluorocarbons subcategory, the polypropylene subcategory, the alkyds and unsaturated polyester resins subcategory, the cellulose nitrate subcategory, the polyamides subcategory, the polyester resins subcategory, the silicones subcategory, the epoxy resins subcategory, the phenolic resins subcategory, and the urea and melamine subcategory. The Act requires the achievement by July 1, 1977 of effluent limitations for point sources which require the application of the best practicable technology available. The Act also requires the achievement by July 1, 1983 of effluent limitations which require the application of best available technology economically achievable, and the achievement by new sources of a Federal standard which reflects the greatest degree of effluent reduction achievable through the application of the best available technology. (Nursey-Florida)
W76-06086

WILLIAMS V. DUKE POWER CO. (SILTING OF STREAM, PONDS, AND LAKE).
For primary bibliographic entry see Field 6E.
W76-06088

MARINE CONSERVATION ACT, AMENDMENTS.
For primary bibliographic entry see Field 6E.
W76-06091

CALDWELL V. GOLDBERG (DISCHARGE OF EFFLUENT FROM SEWAGE PLANT INTO DRAINAGE DITCH).
For primary bibliographic entry see Field 6E.
W76-06093

OLIVER V. HYLE (TERMINATION OF WATER AND SEWER SERVICES FOR FAILURE TO PAY ARREARAGES DENIAL OF DUE PROCESS).
For primary bibliographic entry see Field 6E.
W76-06094

ENVIRONMENTAL PROTECTION AGENCY--POULTRY PROCESSING PRODUCTS, PROPOSED PERFORMANCE AND PRETREATMENT STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 80, 18150-61 (1975). 12 p, 16 tab.

Descriptors: *Industrial wastes, *Classification, *Federal Water Pollution Control Act, *Water quality standards, *Waste treatment, Waste water treatment, Regulation, Legislation, Methodology, Effluents, Pollutants, Water pollution sources, Wastes, Measurement, Standards, Ducks(Domestic).
Identifiers: *Poultry wastes.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency (EPA) is proposing effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources for the newly added chicken processor subcategory, turkey processor subcategory, fowl processor subcategory, duck processor subcategory, and other processing subcategories of the meat products point source category. The general methodology used in developing the limitations, guidelines and standards are set forth. The poultry processing industry was divided into the above subcategories based on the following factors: type of raw material; waste water characteristics; final product; and production process. Most of the waste water pollutants produced by these subcategories are the result of slaughtering and evisceration activities. Despite the different characteristics of these pollutants, the EPA has found that all raw wastes from all subcategories are amenable to measurement and characterization by the pollutant parameters. A description of the best practible control technology currently available and the best available technology economically achievable for each subcategory is set forth. Provisions are also presented concerning waste water control cost estimates and energy requirements. (Hoffman-Florida)
W76-06096

NAVIGABLE WATERS PROCEDURES AND GUIDELINES FOR DISPOSAL OF DREDGED OR FILL MATERIAL.
Fed. Reg., Vol., 40, No. 88, 19766-94 (1975). 29 p.

Descriptors: *Navigable waters, *Dredging, *Classification, *Federal jurisdiction, *Alternative planning, High water mark, Regulation, Legislation, Jurisdiction, Bodies of water, Judicial decisions, Legal aspects, Tributaries, Adoption of practices, Administrative decisions.
Identifiers: Aquatic vegetation line.

As a result of the decision in NRDC v. Callaway, public notice has been given of proposed regulations pertaining to the disposal of dredged or fill materials into waters of the United States. In Callaway, the United States District Court overruled the Department of the Army's definition of 'waters of the United States' which had limited the scope of the Department's jurisdiction to 'navigable waters' of the United States. Since this definition was deemed too narrow, four alternative regulations have been proposed which contain a broader definition of 'waters of the United States'. They are: (1) that the Department's jurisdiction be extended to almost every coastal and inland artificial or natural waterbody up to the highwater mark or to the aquatic vegetation line; (2) that it be extended over coastal waters to either the mean high water mark or the salt water vegetation line, and over inland waters to all navigable waters and their primary tributaries up to their headwaters; (3) that jurisdiction be the same as in alternative one, with a different permit system to cover non-navigable waters of the United States; and (4) that jurisdiction be the same as in alternative two, with some changes in the permit system. (Hoffman-Florida)
W76-06097

WATER QUALITY STANDARDS: OREGON (WITHDRAWAL OF PROPOSED RULE MAKING).
Environmental Protection Agency, Washington, D.C.
39 Fed. Reg. 43557-58 (1974). 2 p.

Descriptors: *Dissolved oxygen, *Water quality standards, *Oregon, *Saturation, *Federal Water Pollution Control Act, Water quality, Air, Dams, Spillways, Eutrophication, Fish, Supersaturation, Washington, Idaho, Standards, Aquatic life, State governments, Pollution abatement.

This notice withdraws the notice of proposed rulemaking in which the Environmental Protection Agency (EPA) proposed to set out water quality standards for total dissolved gas for the State of Oregon. The main cause of excessive total dissolved gas pressure, which has a detrimental effect on aquatic organisms, is supersaturated waters from the spillways of dams. As water passes over the top of the spillway, air is forced into solution and supersaturation results. A water quality standard setting total dissolved gas criteria decreases in stringency as it exceeds 100 percent saturation. Oregon's water quality standard for total dissolved gas is 105 percent saturation. The EPA, believing that the 105 percent saturation for total dissolved gas was unreasonably stringent and unachievable, proposed a 110 percent standard. However, since the Federal Water Pollution Control Act gives states the right to adopt and enforce state standards that are more stringent than Federal standards, the EPA has decided to withdraw its notice of proposed rulemaking. (Segall-Florida)
W76-06098

STREAM POLLUTION CONTROL BOARD OF STATE OF INDIANA V. UNITED STATES STEEL CORP. (COMMON-LAW PUBLIC NUISANCE ACTION AGAINST STEEL CORP. IN WHICH PRIVATE CITIZEN SOUGHT TO INTERVENE.
For primary bibliographic entry see Field 6E.
W76-06106

RESERVE MINING CO. V. ENVIRONMENTAL PROTECTION AGENCY (ACTION BY U. S. AND MINNESOTA TO PREVENT DISCHARGE OF TACONITE TAILINGS INTO WATER OF LAKE SUPERIOR BY PROCESSING COMPANY).
For primary bibliographic entry see Field 6E.
W76-06107

UNITED STATES V. LEWIS (ACTION TO ENJOIN CONSTRUCTION OF A CAUSEWAY ACROSS A TIDAL MARSH WITHOUT PERMIT REQUIRED UNDER THE RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 6E.
W76-06108

COMMONWEALTH, DEPARTMENT OF NATURAL RESOURCES V. WESTMORELAND-FAYETTE MUNICIPAL SEWAGE AUTHORITY (APPEAL BY MUNICIPAL ENTITY FROM ORDER TO CURB DISCHARGE OF UNTREATED SEWAGE INTO WATERS OF PENNSYLVANIA.,
For primary bibliographic entry see Field 6E.
W76-06115

EURASIAN WATER-MILFOIL IN MICHIGAN,
Auckland Univ. (New Zealand). Dept. of Botany.
B. T. Coffey, and C. D. McNabb.
Mich Bot. 13(3) p 159-165, 1974.

Descriptors: *Michigan, Great Lakes, Lakes, Herbicides, Viruses, Submerged aquatic plants, Nuisance algae, Water pollution control.
Identifiers: Ceratophyllum-Demersum, Chara-Sp, Elodea-Canadensis, *Eurasian(Water-milfoil), *Myriophyllum-Spicatum, Najas-Sp, Potamogeton-Simplifolius, Vallisneria-Americana, Budd Lake(Mich).

Myriophyllum spicatum has become common in the Great Lakes region, and is a considerable nuisance. The history of its introduction into the country is reviewed. Control measures including herbicides and the effects of a natural virus are discussed. Plant communities in Budd Lake are discussed; major associated in these communities are Vallisneria americana, Chara sp., Potamogeton amplifolius, Najas sp., Elodea canadensis, Ceratophyllum demersum.--Copyright 1974, Biological Abstracts, Inc.
W76-06149

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

RESERVOIR MANAGEMENT VIA RELIABILITY PROGRAMMING,
Politecnico di Milano (Italy). Istituto di Elettrotecnica ed Elettronica.
For primary bibliographic entry see Field 4A.
W76-05508

ENVIRONMENTAL CONSIDERATIONS IN RIVER BASIN PLANNING AND DECISION MAKING,
Arizona Univ., Tucson, Inst. of Renewable Natural Resources.
For primary bibliographic entry see Field 4A.
W76-05510

THE ROLE OF INLAND NAVIGATION IN RIVER BASIN DEVELOPMENT,
Magyar Tudomanyos Akademia, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-05511

SYSTEMS APPROACH TO RIVER BASIN AND INTERBASIN DEVELOPMENT,
Washington Univ., Seattle.
For primary bibliographic entry see Field 4A.
W76-05512

UNCERTAINTY IN WATER RESOURCES DECISION MAKING,
Water Resources Center, Budapest (Hungary).
I. Bogardi.
Working Paper No. 10, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 8 fig, 30 ref. (United Nations, Department of Economic and Social Affairs)

Descriptors: *Risks, *Water resources, *Decision making, *River basin development, Water management, Economics, Stochastic processes, Cost-benefit analysis, *Optimization, Equations, Mathematical models, Systems analysis, Methodology.
Identifiers: Multiobjective planning, Developing countries.

Optimum decision making in river basin development should consider the uncertainties due to natural phenomena (natural uncertainty), insufficient information (sample uncertainty), and the limited understanding of natural, technological and economic processes (model uncertainty). Non-optimum decisions may cause economic losses and/or adverse social and political effects in the economy of any nation, especially in developing countries. In this line, the use of modern decision-analysis methodology is recommended in order to reach optimum decisions under the various uncertainties mentioned. Principles of such methods are emphasized without the strict mathematical formulations which are available in the literature cited. However, results of the use of various methods are shown. The task of applying decision sciences to river basin development in developing countries in the face of limited data (hydrologic, economic, etc.,), funds, technology and manpower is a difficult one, but it is hoped that this paper will provide some guidelines for this purpose. (Bell-Cornell)
W76-05513

A CASE STUDY REPORT ON THE VISTULA RIVER BASIN,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-05514

THE OUT-OF-KILTER ALGORITHM AND SOME OF ITS APPLICATIONS IN WATER RESOURCES,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
J. Kindler.
Working Paper No. 12, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 28 p, 4 fig, 10 ref, append. (United Nations, Department of Economic and Social Affairs)

Descriptors: *Water resources, *Management, *Water allocation(Poligy), *Linear programming, Computer programs, *Algorithms, Networks, Flow, Circulation reservoirs, Storage, Pumping, Planning, Equations, Mathematical model Systems analysis.
Identifiers: *Out-of-kilter algorithm, Cost minimization.

Although conventional techniques are inadequate to plan and formulate complex water resources systems, given the many variables, inputs and outputs, the 'system approach' provides water resources planners with a much better set of tools than were available 10 to 15 years ago. In a Case Study Report on the Vistula River Basin (Working Paper No. 11 of UNDP/UN Seminar), reference was made to the so-called Water Resources Management (WRM) Model developed and applied in the framework of the UNDP/UN sponsored 'Vistula River Project.' Although this paper is not a complete description of the WRM Model, it provides illustration of one of its most important parts, the out-of-kilter algorithm. Presented is a comparatively simple water resources allocation model based on Fulkerson's out-of-kilter algorithm. It is a special purpose linear programming method which has been efficiently used for solution of a number of water resources problems. The model is presented in the form of a complete computer program OKAY written in the Fortran language. Potential applications of the model are illustrated by a few computational examples. Although in principle this is an allocation model for a single time period, the possibilities of its extension to multiperiod analysis are also briefly discussed. (Bell-Cornell)
W76-05515

RIVER BASIN MODELS AND THEIR APPLICATION WITH SCARCITY OF DATA.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 4A.
W76-05516

A REVIEW OF SOME HYDROLOGICAL STUDIES REQUIRED IN THE DESIGN OF WATER MANAGEMENT PROJECTS.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 4A.
W76-05517

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
For primary bibliographic entry see Field 4A.
W76-05519

VIEWS ON RIVER BASIN DEVELOPMENT IN THAILAND,
Bangkok Metropolitan Water Works Authority (Thailand).
For primary bibliographic entry see Field 4A.
W76-05520

MINIMIZING THE OPERATING AND CAPITAL COSTS OF WATER SUPPLY PROJECTS,
Claremont Men's Coll., Calif. Dept. of Mathematics.
J. B. Lucke.
Available from the Microfiche from American Geophysical Union, Wash., D. C. 20006, for $1.00. Document 76-002. Water Resources Research, Vol. 12, No. 1, p 101, February 1976.

Descriptors: *Water supply, *Projects, *Operating costs, *Capital costs, Algorithms, Networks, Dams, Mathematical models, Systems analysis, Dynamic programming, Optimization.
Identifiers: *Cost minimization.

Sequencing the expansion of water supply projects to minimize discounted operating and capital costs can be formulated graphically as finding a least cost path from the present to the fully expanded future. Considered herein are four alternate assumptions concerning the relationships of operating costs and production. A simple dynamic programming algorithm or minimal cost network algorithm can be readily used in conjunction with a computer to solve the problem. (Bell-Cornell)
W76-05522

RECORDS AND DRILLING REPORTS.
Water Well Journal, Vol. 30, No. 1, p. 30, January 1976.

Descriptors: *Documentation, *Data collections, *Drilling, *Drillers logs, Logging(Recording), Subsurface mapping, *Operations, Monitoring.
Identifiers: *Water well drilling forms, Well drilling estimates.

Paper work, forms and procedures for any well drilling operation are outlined. Systematic record keeping methods are described and helpful record keeping hints are presented. Procedures for drawing up estimates, contracts, work orders, well logs, billing statements and maps are described. (Heiss-NWWA)
W76-05557

WATER MANAGEMENT CONTROL SYSTEM FOR THE ZAGYVA-TARNA RIVER BASIN,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-05746

REAL-TIME MANAGEMENT OF WATER-RESOURCE SYSTEMS,
Thames Water Authority, Reading (England). Operational Research Unit.
D. G. Jamieson.
Working Paper No. 20, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 3 fig, 13 p, 5 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water resources development, *Management, *Multiple-purpose reservoirs, *Automatic control, Dynamic programming, Simulation analysis, Optimization, Digital computers, Forecasting, Telemetry, Data collections, Radar, Storage, Water policy, Operations research, River regulation, Hydrology, Mathematical models.
Identifiers: *Real-time management, River Dee(North Wales), Conjunctive operation, Cost minimization.

At the design stage, too little attention is paid to the way in which the proposed water resource system is to be managed. Operating rules are usually assumed rather than derived objectively, and the only acknowledgement to the inherent management difficulties is the addition of a fixed percentage on all releases to cover 'operating losses.' If the scheme is ever constructed, inevitably the problems associated with operating the system in real-time must be faced. Usually, such a scheme would have to be operated conjunctively with other existing reservoirs, or perhaps the scheme has been promoted with multiple objectives. Whatever the particular circumstances, the competent management of complex water resource systems generates formidable operating difficulties. This report shows how some of these problems were overcome by formulating automated control procedures for a series of multi-purpose reservoirs which regulate the River Dee in North Wales. Radar is used in association with other sensors to establish the existing state of the system. The action of the small control computer is to process the telemetered data on-line, forecast the future state of the system and decide the optimal releases from storage. The forecasting is based on digital simulation and the decision mechanism on dynamic programming. (Bell-Cornell)
W76-05747

EX-POST EVALUATION OF RIVER BASIN DEVELOPMENTS IN PAKISTAN,
Arizona Univ., Tucson.
S. M. H. Bokhari.
Working Paper No. 22, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 26 p, 1 fig, 2 tab, 17 ref.

Descriptors: *River basin development, Evaluation, Projects, Alternative planning, Water law, Management, History, Design, Operations, Constraints, Aquifers, Storage, Water quality, Methodology, Economic efficiency, *Post-impoundment.
Identifiers: *Pakistan, *Developing countries, Cost-effectiveness approach, Tubewells.

River basin developments in Pakistan during the last 125 years have progressively produced a unique water system: the biggest integrated single network of dams, diversion weirs, interbasin links, and irrigation canals. But inadequate drainage and primitive farm management have made fertile irrigated lands saline and waterlogged. A multiobjective Reclamation Program aiming at eradication of waterlogging and salinity, reclamation of already affected lands and augmentation of water availability throughout the irrigated areas was launched in 1959-60. The program included 26 tubewells and drainage projects. SCARP I was the first project to be completed in 1963. The ex-post evaluation of this project using the cost-effectiveness approach is presented. It is verified that most of the objectives of the Public Reclamation Program could be achieved more efficiently and at a much less cost by encouraging farmers to install their own tubewells. It has been observed that some assumptions made by the planners were not so close to the real life. Planning and design criteria did not match the local conditions, causing shortfalls in the planned targets. New guidelines are being evolved for drawing up a comprehensive Master Plan for the entire irrigated areas. Pakistan's self-sufficiency will depend on the timely completion and optimum management of this program, which is equally important for the overall economic development as agriculture is the mainstay of Pakistan's economy. (Bell-Cornell)
W76-05748

THE CZECHOSLOVAK WATER DEVELOPMENT PLANNING APPROACH AND ITS APPLICATION,
Ministry of Forest and Water Management, Prague (Czechoslovakia).
M. Jermar, and V. Plecnac.
Working Paper No. 23, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 9 p.

Descriptors: *Water resources development, *Comprehensive planning, Water utilization, Management, Decision making, Economics, Control, Social aspects, Water law, Projects, Research, Water allocation(Policy), Optimum development plans.
Identifiers: *Czechoslovakia, Developing countries, Objectives.

The final objective of the Czechoslovak complex planning approach is a systematic control of the comprehensive interrelations among water, nature, and various society aims. Three stages can be distinguished in the integrated application of the approach to water resources utilization in developing countries: (1) enactment of a modern water law, stabilization and simplification of the structure in the field of water development, and intensification of efforts in coordination of surveys and investigation; (2) approval of basic standards and by-laws, and establishment of a water resources planning institute--strengthening the planning department of the central water management board; and (3) identification of development priorities based on the middle-term plan, definition of economic goals as they relate to the development and beneficial utilization of water resources, and determination of water use projections and the locations and times of their expected utilization. Projecting to the ultimate stage technically imaginable on the basis of realistic development trends and not the economy of one single stage should be the key factor of the decision-making process. (Bell-Cornell)
W76-05749

THE COLUMBIA BASIN PROJECT REAPPRAISED,
Central Washington State Coll., Ellensburg.
For primary bibliographic entry see Field 4A.
W76-05750

EVALUATION OF THE EFFECTS OF WATER TRANSFER,
Research Inst. for Water Resources Development, Budapest (Hungary).
M. Domokos.
Working Paper No. 25, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, September 1975, Budapest, Hungary. 30 p, 6 fig, 11 ref.

Descriptors: *Water transfer, *Evaluation, *Effects, Measurement, Projects, Water shortage, Water demand, Water utilization, Optimum development plans, Inter-basin transfer, Systems analysis, Alternative planning, Cost-benefit ratio, Investment, Simulation analysis, Risks.
Identifiers: Danube-Tisza Canal(Hungary), Least cost.

The measures aiming at an elimination of water shortages either (1) decrease water demands, or (2) increase utilizable water resources or harmonize the areal and time distribution of these two factors. By water transfer, belonging to the second group of measures, a physical transportation of water between two catchment areas of equal rank is meant. A water transfer is justified (a) if it is the least-cost one of all solutions possible for eliminating the given water shortage; (b) if the advantages achieved by it exceed the sum of disadvantages caused by it plus the cost of the diversion; and (c) if it is the most productive among the possible alternative investments of the national economy. This paper considers also the prospective Danube-Tisza Canal in Hungary. The purposes of the Canal are: (a) water transfer from the Danube into the Tisza River basin; (b) the foundation of economic development within the influence zone of the Canal; (c) a useful complementing of the European waterway-system; (d) land drainage; and (e) recreation potentials. (Bell-Cornell)
W76-05751

DECISION MAKING AND PLANNING FOR RIVER BASIN DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
L. Duckstein.
Working Paper No. 27, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 28 p, 5 equ, 62 ref.

Descriptors: *River basin development, *Decision making, *Alternative planning, Classification, Mathematical models, Equations, Algorithms, Optimization, Systems analysis, Cost-benefit analysis, Methodology, Evaluation, Hydrology, Economics, Operations research, Risks.
Identifiers: Multiple purpose, Multigoal problems, Multiobjectives, Benefit-risk analysis, Bayesian decision theory, Induced safety algorithm, Sensitivity analysis.

The functioning of a river basin is first described in terms of a simple system model in order to agree on terminology and set the stage for a classification of decision and planning problems. In this classification, a distinction is made between single and multiperiod, then multipurpose and multigoal problems. The possible level and phase of development of a river basin is examined and the types of uncertainties that arise in planning are briefly reviewed. Basic tools for analyzing river basin development go from benefit-cost analysis to multiobjective programming and cost-effectiveness analysis (CE) schemes. It appears that the CE methodology provides a simple, yet fairly comprehensive, step-by-step approach to water resources management, including ex-post or hindsight studies. In this spirit, papers of the seminar that are relevant to the present topic are reviewed along the basic steps of CE. Difficulties may emerge as soon as one of the steps of CE is not considered, starting with the failure to define carefully economic, social, and environmental objectives. (Bell-Cornell)
W76-05752

INTER BASIN TRANSFER OF WATER RESOURCE CASE STUDY OF INDUS PROJECT,
West Pakistan Water and Power Development Authority, Lahore.
For primary bibliographic entry see Field 4A.
W76-05753

TECHNICAL-ECONOMIC PLANNING OF THE GABCIKOVO-NAGYMAROS BARRAGE PROJECT FOR THE DEVELOPMENT OF THE CENTRAL-DANUBE BASIN,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-05754

SOCIAL IMPACTS OF INTEGRATED RIVER BASIN DEVELOPMENT ON LOCAL POPULATIONS,
California Inst. of Tech., Pasadena. Div. of Humanities and Social Sciences.
T. Scudder.
Working Paper No. 30, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 22 p, 23 ref. (United Nations, Department of Economic and Social Affairs)

Descriptors: *Social impact, *River basin development, *Project planning, *Human population, Relocation, Behavior, Attitudes, Stress, Communication, Dams.
Identifiers: *Socio-cultural systems, Developing countries.

While economic impacts are carefully assessed in project planning, and increasing attention is being paid to ecological impacts, social impact statements have yet to gain wide acceptance. A more careful consideration of the effects of river basin development on the socio-cultural systems of local populations would enable decision makers to avoid the costly mistakes of the past which are all too frequently repeated. Local populations can be divided into a) those undergoing relocation as a result of dam construction and subsequent inundation; b) those among whom the relocatees are resettled; c) other river basin residents who are neither relocatees or hosts; and d) immigrants. Systematic research has been carried out among categories a and b, which has important policy implications. Compulsory relocation is characterized by multidimensional stress. In attempting to cope with this stress and to adapt to their new homes and neighbors, the relocatees appear to respond as if a socio-cultural system was a closed system. As for the hosts, resettlement authorities should anticipate future land disputes with the relocatees. Far too little research has been carried out on the impacts of river basin development as such on other river basin residents and on immigrant populations. The best development strategy is to facilitate local initiative by improving communications with river basin residents throughout the period of project planning and implemetation. (Bell-Cornell)
W76-05755

INTERNATIONAL MANAGEMENT OF THE RIVER PLATE BASIN,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-05756

SIMULATION AS A TOOL IN INTERNATIONAL RIVER DEVELOPMENT,
Karlsrube Univ. (West Germany). Institut fuer Wasserbau III.
E. J. Plate.
Working Paper No. 32, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 28 p, 10 fig, 11 equ, 12 ref. (United Nations, Department of Economic and Social Affairs)

Descriptors: *River basin development, *Simulation analysis, *Water resources, *Planning, Systems analysis, Mathematical models, Equations, Reservoirs, Floods, Costs, Hydrology, Discharge(Water), Daily, Stochastic processes, Markov processes.
Identifiers: Monte Carlo method.

International river basins are, from the point of view of operations research, water resources systems which can be treated just like water resource systems within national boundaries. After the strategies that are possible to the nations concerned have been evaluated, they will result in constraints which the system optimization must satisfy. To allow for the stochastic nature of the hydrological data which form the input to water resources systems, it is recommended to explore whether the problem can be solved by simulation analysis. The method of simulation permits giving confidence limits to the optimal solution, but it may have the disadvantage of requiring large computers, particularly if large numbers of parameters have to be varied in order to reach optimal conditions. The methods of simulation, including Monte Carlo modeling, Markov processes, and the Thomas-Fiering model, which have been found useful in the work of the author's Institute are outlined and some typical problems discussed. The importance of the characteristic time in selecting themodel is pointed out, and a new method for generating daily discharges is described. (Bell-Cornell)
W76-05757

LONG RANGE PLANNING OF WATER RESOURCES: A MULTI OBJECTIVE APPROACH,
National Water Authority, Budapest (Hungary). Dept. of Water Management Policy.
D. Laszlo, and L. Duckstein.
Working Paper No. 36, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 41 p, 6 fig, 6 tab, 22 ref. (United Nations, Department of Economic and Social Affairs)

Descriptors: Water resources, *Long-term planning, *River basin development, *Water management(Applied), Alternative planning, Methodology, Algorithms, Probability, Economics, Reservoirs, Canals, Groundwater storage, Systems analysis, Hydrology, Social aspects.
Identifiers: *Multiobjective approach, *Tisza River basin(Hungary), *Cost-effectiveness approach, Sensitivity analysis.

This paper compares alternative long-range development schemes of an existing water resources system in Hungary. System goals are to meet increasing economic and social requirements of water management. A comprehensive cost-effectiveness approach has been adapted to define the goals, specifications, criteria, and alternatives and their capabilities. Specifications include demands given in probabilistic terms. The energy balance leads to an explicit criterion. Important factors involving social elements, such as flood protection or land and forest use, are described both as monetary quantities and qualitative appreciations. The multi-criterion algorithm ELECTRE is then used to rank systems and reduce the problem to the trade off between only two alternatives. The methodology is applied to a water resources system in the Hungarian great plain of the Tisza River basin. (Bell-Cornell)
W76-05760

FLOOD LOSS MANAGEMENT IN DEVELOPING COUNTRIES: A MODEL FOR IDENTIFYING APPROPRIATE STRATEGIES,
Victoria Univ. (British Columbia). Dept. of Geography.
W. R. D. Sewell, and H. D. Foster.
Working Paper No. 39, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 30 p, 4 fig, 2 tab, 8 ref. (United Nations, Department of Economic and Social Affairs.)

Descriptors: *Flood control, *Management, *Economics, Flood plains, Risks, Optimum development plans, Mathematical models, Systems analysis.
Identifiers: *Flood loss, *Developing countries, Economic growth, Economic development, International cooperation.

In many developing countries, the magnitude of future potential flood losses is increasing rapidly, particularly as a result of the movement of industries and their associated labor forces onto flood plains. In such areas, they are unprotected by sophisticated engineering works, land use regulations, or satisfactory warning and evacuation systems. Heavy flood losses, therefore, commonly occur. Presented is a heuristic model which can be used to relate a country's flood problem to the level of development that is appropriate in adjusting to it. Suggestions are made concerning specific strategies that countries with differing levels of economic development and degrees of risk might adopt to reduce flood hazards. A wide range of potential adjustments is described. These adjustments include flood protection, watershed management, land use regulations, flood warning and emergency evacuation measures, and insurance. The risk-growth-sophistication matrix presented in this paper also clearly illustrates the value of international cooperation in dealing with the flood problem. Without such assistance, many developing countries may continue to suffer large flood losses which could prevent their economies from generating sufficient capital to allow the mitigation of future damage. It is argued that international aid and technical cooperation may provide the key to solving this dilemma. (Bell-Cornell)
W76-05761

MULTIPURPOSE RIVER PROJECT PLANNING IN THE LOWER MEKONG BASIN: A DECISION APPROACH,
Economic Commission for Asia and the Pacific, Bangkok (Thailand).
K. Chaemsaithong.
Working Paper No. 41, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 17 p, 1 fig, 2 tab, 16 ref. (United Nations, Department of Economic and Social Affairs)

Descriptors: *River basin development, *Project planning, *Decision making, *Multiple purpose, Methodology, Alternative planning, Hydrology, Simulation analysis, Economic feasibility, Optimum development plans.
Identifiers: *Lower Mekong basin(Thailand), Cost-effectiveness approach.

The underlying objectives of water resource development involve social, economic, and environmental considerations. In planning, careful analysis of the interrelated social, economic, and environmental effects should be made in the process of examining water resource alternatives for attaining desired objectives. Kazanowski's cost-effectiveness methodology may be effective for providing a guideline for developing a decision making process for analyzing water resource alternatives. Because studies of social, economic, and environmental characteristics of each alternative are not completed at this point, the material presented does not suggest which particular alternative scale of development should be selected but only illustrates a framework for the decision making process which might be followed later on. The decision making process presented includes identification of system requirements for attaining the desired objectives of development and determination of project effects generated from each alternative. The process of selecting the best alternative involves analysis of the merits of each alternative with respect to the selected decision criteria in subjective order of ranking, and a choice of applying either a fixed-cost or fixed-effectiveness objective. (Bell-Cornell)
W76-05762

AN ECONOMIC MODEL OF WATER USE AND WASTE TREATMENT,
Houston Univ., Tex.

For primary bibliographic entry see Field 5D.
W76-05814

DETAILED ECONOMIC MODELS FOR INDUSTRIAL AND OTHER ACTIVITIES,
Bari Univ. (Italy).
For primary bibliographic entry see Field 5G.
W76-05817

SOCIAL IMPACT ASSESSMENT: AN ANALYTIC BIBLIOGRAPHY,
Brown Univ., Providence, R. I.
For primary bibliographic entry see Field 6B.
W76-05820

SOCIAL SCIENCE DATA BANKS AND THE INSTITUTE FOR WATER RESOURCES,
American Univ., Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-05822

AN ECONOMIC ANALYSIS OF WATER USE IN COLORADO'S ECONOMY,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-05837

MULTI-OBJECTIVE WATER RESOURCES PLANNING: METHODOLOGY TO ACHIEVE COMPATIBILITY BETWEEN ENVIRONMENTAL AMENITIES AND ECONOMIC DEVELOPMENT,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 6B.
W76-05840

APPLICATION OF MULTI-REGIONAL PLANNING MODELS TO THE SCHEDULING OF LARGE-SCALE WATER RESOURCE SYSTEMS DEVELOPMENT,
Geological Survey, Reston, Va.
D. W. Moody.
Journal of Hydrology, Vol 28, No 2/4, p 101-125, February 1976. 3 fig, 2 tab, 14 ref.

Descriptors: *Regional analysis, *Regional economics, *Water resources development, *Model studies, *Project planning, Water demand, Cost analysis, Hydrology, Groundwater, Surface waters, Water yield, Groundwater recharge, Water importing, Aquifer characteristics, Hydraulic structures, *Puerto Rico.
Identifiers: *Mixed-integer programming model.

This paper describes a water resources planning model that is also formulated as a mixed-integer program. A given geographic area is divided into planning regions within which regional water demands are assumed to be located at single points. Water import and export projects interconnect the planning regions. For each planning period, the model determines the water-supply projects to be built and the amount of water to be produced, treated, and imported or exported to meet future water demands at minimum present cost. Model constraints include a response function which relates groundwater withdrawals to aquifer recharge induced from stream segments that form boundaries of the aquifer. The use of this model in conjunction with several water demand models, used to evaluate the impact of nonstructural measures, are also discussed in the context of water resources planning in the Commonwealth of Puerto Rico. (Woodard-USGS)
W76-05846

SOCIAL ASSESSMENT MANUAL: A GUIDE TO THE PREPARATION OF THE SOCIAL WELL BEING ACCOUNT,
Abt Associates, Inc., Cambridge, Mass.

For primary bibliographic entry see Field 6B.
W76-05993

A PORTFOLIO APPROACH TO PUBLIC WATER PROJECT DECISION MAKING,
Wesleyan Coll., Macon, Ga. Dept. of Business Administration.
For primary bibliographic entry see Field 6B.
W76-05995

6B. Evaluation Process

SOCIOLOGICAL ANALYSIS OF DAM IMPACT: A STUDY OF TWENTY-TWO LARGE DAMS IN TEXAS,
Texas A and M Univ., College Station. Dept. of Sociology and Anthropology.
R. C. Schaffer.
In: 'Reservoir Impact Study,' p. 2.i-2.159, November 1974. 45 tab, 7 ref, 1 append.

Descriptors: *Project post-evaluation, *Reservoirs, *Social impact, *Economic impact, *Attitudes, Surveys, *Texas, Benefits, Flood control, Recreation, Land use, Management, Urbanization, Institutions.
Identifiers: *Reservoir impact, *Canyon Reservoir(Tex), Guadalupe River(Tex), Land acquisition.

The initial attitudes of community leaders and organizations toward construction of 22 reservoirs in Texas during the periods of 1944-48, 1951-54, and 1963-68 were surveyed and their perception of the impact of the reservoirs were evaluated from the perspective of time, with primary focus on Canyon Lake on the Guadalupe River, Texas. Over 75% of the leaders had favored dam construction originally; of those opposed, approximately 20% were later convinced of the value of the dam to their community. Most of the local organizational support came from Chambers of Commerce while opposition stemmed from affected land owners. Respondents indicated that the dams had resulted in major economic gains in terms of increased land values, water-related commerce, building, and bank deposits and loans; and that landowners and investors in each area and businesses were the principal economic beneficiaries. More than 90% emphasized the importance of the enhanced recreational opportunities, while more than 20% were impressed with the number of local families who used the facilities frequently. They agreed that flood protection was enhanced; and over 70% felt that construction had assured an adequate water supply. Most felt that the federal government should have considerable responsibility for planning, construction, and operation of a dam. There was general satisfaction, except for the land acquisition process, with the efforts of the Corps of Engineers in all three areas. (See also W76-04501) (Auen-Wisconsin).
W76-05501

COPING WITH FLOOD HAZARD IN NEW BRAUNFELS AND SEGUIN, TEXAS,
Southern Illinois Univ., Carbondale. Dept. of Geography.
For primary bibliographic entry see Field 6F.
W76-05502

SOME ECONOMIC AND DECISION ASPECTS OF THE CANYON PROJECT,
Texas A and M Univ., College Station. Dept. of Geography; and Texas A and M Univ., College Station. Dept. of Geology.
E. Cook.
In: 'Reservoir Impact Study,' p. 6.i-6.54, November 1974. 8 fig, 10 tab, 14 ref.

Descriptors: *Reservoirs, *Project post-evaluation, *Benefits, *Decision making, River basin development, Economic impact, Environmental effects, Public benefits, Social impact, Planning, Direct benefits, Indirect benefits, Discount rates, Costs, Flood control, Economic efficiency, Cost-benefit ratio, Texas, Estimating, Property values, Recreation.
Identifiers: *Canyon Dam(Texas), Guadalupe River(Texas).

The anticipated benefits and projected costs in the planning stages of the Texas' Canyon Dam and Reservoir on the Guadalupe River are detailed and discussed. The anticipated regional economic development, benefits from navigation, generation of electricity, conservation storage, and flood control were either totally unrealized or partially realized. On the basis of national economic efficiency Canyon Dam now exceeds unity only if recreation benefits are included in the calculation; the project is justified by a very narrow margin at the 5.625% discount rate. The water-conservation benefits appear to be considerably lower than projected in the 1959 benefit-cost analysis. The recreation benefit has greatly exceeded forecasts and is higher than the flood-loss and water-conservation benefits. Analysis of the planning process indicated inadequate public participation, lack of consideration of alternatives, and that little attention was given to secondary benefits and almost none to secondary costs. Comparison of the planning process with the proposed similar dam at Clopton Crossing, indicated little change in the basic decision process. Most of the primary beneficiaries still were not called upon to bear any user or repayment charges, no local public hearing was held until after Congressional project authorization; there remained a complete lack of any role in the decision process for disinterested analysis. Recommendations are made for changes in the decision processes based on identified value judgments. (See also W76-04501) (Auen-Wisconsin).
W76-05505

AN EVALUATION OF SOME RECREATIONAL, DEMOGRAPHIC AND ECONOMIC IMPACTS OF CANYON LAKE,
Texas Agricultural Experiment Station, College Station. Dept. of Recreation and Parks.
J. C. Stribling, C. Burchell, F. Clark, R. Miller, and M. Seminara.
In: 'Reservoir Impact Study,' p. 7.i-7.38, November 1974. 8 fig, 8 tab, 9 ref.

Descriptors: *Reservoirs, *Economic impact, *Social impact, *Recreation, *Human population, Project post-evaluation, Texas, Social aspects, Agriculture, Urbanization, Transportation, Public utilities, Flood plains, Land use.
Identifiers: *Reservoir impact, *Canyon Lake(Texas), Guadalupe River(Texas), Commerce.

The impact of Canyon Reservoir on population growth, settlement, and characteristics, housing and urbanization, transportation, utilities, communications, wholesale and retail trade, recreation, and agriculture in the primary impact area and the seven-county area centered on Comal County, Texas, are compared with what would have occurred had the reservoir not been built. The existence of approximately 100 houses, cottages, and cabins on the floodplain can be attributed to the dam. The potential number of canoe rentals, picnic and camp grounds enterprises was diminished by one-half since that portion of the Guadalupe River inundated was similar to that immediately below the dam. Rainbow trout fishing would not be possible without the reservoir. Approximately 12,000 inundated acres would have been available for agriculture. The most pronounced difference in land use attributable to the reservoir is the subdivision development in the vicinity of the lake, where the population has increased by almost 2000. The new permanent residents are of a higher median age, have higher incomes, and outnumber the older residents. Seven public recreation areas have been added. Highway construction and main-

tenance is higher. The most notable effect is the rise in land values near the reservoir thus increasing property tax revenues. The economic and demographic impacts diminish rapidly away from Canyon Lake. (See also W76-04501) (Auen-Wisconsin).
W76-05506

UNCERTAINTY IN WATER RESOURCES DECISION MAKING,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-05513

A REVIEW OF SOME HYDROLOGICAL STUDIES REQUIRED IN THE DESIGN OF WATER MANAGEMENT PROJECTS.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 4A.
W76-05517

GOALS AND FORMS OF CO-OPERATION AMONG COUNTRIES FOR THE DEVELOPMENT OF INTERNATIONAL RIVER BASINS,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-05521

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOL. II OF V. ESTIMATING INITIAL RESERVOIR RECREATION USE,
Army Engineer District, Sacramento, Calif.
R. E. Brown, D. M. Crane, C. R. DesJardins, and R. Hydra.
Army Engineer Institute for Water Resources Fort Belvoir, Virginia, IWR Research Report 74-R1, June 1974. 393 p. 117 fig., 40 tab.

Descriptors: *Estimating, *Recreation, *Reservoirs, *Methodology, Use rates, Recreation demand, Surveys, Forecasting, Statistics, Data collections, Facilities.

Methodology for estimating initial recreation use at prospective Corps of Engineer reservoirs, based on the 'most similar project' concept, is described. Recreation-use data were collected from surveys of recreationists at 52 reservoirs of various sizes and characteristics from different areas of the United States. About 238,000 sampling units (vehicles) comprising about 735,000 individuals were surveyed, reflecting a diversity of regional conditions and population characteristics. The data were representative of almost all recreationists visiting a particular reservoir. Standard statistical measures were used to determine reliability of collected statistics in estimating recreation use. Pertinent data, such as per capita use rates and recreation-use data summaries, are given for each reservoir. Based on these data, methodology was developed for estimating recreation attendance at proposed projects. Detailed discussion and evaluations of prospective reservoir projects and criteria for selecting similar projects are included. Although much of the guesswork for estimating recreation use and benefits for reservoir projects is eliminated, it is not the final solution as there are inherent deficiencies. The technique will be reviewed and improved as more recreation-use data are collected. (See also W75-10342 thru W75-10345) (Buchanan-Davidson--Wisconsin).
W76-05611

HOW TO GUIDE GROWTH IN SOUTHEASTERN NEW ENGLAND, PARTS I, II AND IV OF THE DRAFT REPORT.
New England River Basins Commission, Boston, Mass. Southeastern New England Study.
For primary bibliographic entry see Field 6G.
W76-05649

PERSPECTIVE 75.
East Central Florida Regional Planning Council, Winter Park.
1974. 50 p, 17 tables.

Descriptors: *Floods, Evaluation, *Community development, *Economic impact, *Aquifers, *Land use, *Water quality, *Sewage treatment, *Water supply, Population, Construction, Recharge, Marshes, *Florida.
Identifiers: Brevard County(FL), Indian River County(FL), Lake County(FL), Orange County(FL), Seminole County(FL), Orlando(FL), East Central Florida, Retired persons, Tourists, National economy, Lake Washington(FL), Osceola County(FL).

Using selected time series data (population indices, employment, social security beneficiaries, retail sales, non-agricultural employees), this non-technical, short term economic overview of the East Central Florida Region explores the present economic state of each county and analyses the issues and ramifications of gaining more development. Lake and Indian River counties, the counties most dependent on agriculture, suffered a slowing of economic activity in 1974. Yet population continued to increase in both counties mainly as the result of retiree in-migration demanding new residences and services. A gradual economic recovery is expected in 1975. The Oklawaha River Basin Plan to improve sewage treatment is progressing. Lake County must prepare controls for development of the recharge area for the Floridan aquifer which supplies water for much of central Florida. Brevard County, still adjusting to the reduction in employment at Kennedy Space Center with the commensurate decline in demand for goods and services, attempted to recruit new employers in other fields. Increased retail sales were attributed to the influx of retirees. Tourism is becoming increasingly vital to the economy. Bonds are being used to upgrade, extend, and integrate the Brevard sewage treatment facilities. Concern over water supply is complicated by reliance on increasingly polluted Lake Washington. Orange, Seminole, and Osceola Counties, comprising the Orlando Metropolitan Area, are also recruiting employers with prospects for economic diversification boosted by the current surplus of labor and facilities. East Orlando and Orange County are waiting for construction of a sewage treatment plant to relieve the present overburdened plant. (Henley - North Carolina)
W76-05651

STRUCTURING COMMUNICATIONS PROGRAMS FOR PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
A. B. Bishop.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A012 280, $6.00 in paper copy, $2.25 in microfiche. DACW73-72-C-0069. Prepared for US Army Engineer Institute for Water Resources, Fort Belvoir, VA, May 1975. 125 p, 22 fig, 3 tab, 27 ref.

Descriptors: Water resources, *Project planning, *Project feasibility, *Communication, *Planning, Water quality, *Federal Water Pollution Control Act, Social aspects, Legislation, Costs, Benefits, Administration.
Identifiers: *Public participation, *Environmental impact assessment, *Water quality management, River basin planning, Level B planning of river basins.

Though recent Federal legislation requires public involvement in the planning processes, and efforts have been made to implement this legislation, much more can be done to involve citizens in planning for water and related land-use programs. Planning is viewed as a series of steps consisting of problem definition, formulation of alternatives, impact analysis, and evaluation. Public participation must be actively sought. There are 2 objectives of participation from an agency's point of view: to inform and to get reaction to proposals. These can be met by 4 tasks: identify problems and needs; generate ideas and solve problems; review planning data and analysis; and provide values and preferences for decisions. Each task can and should be actively participated in by citizens. Identification of publics is an important element. Conceptually, publics can be classed into those affected by the problem (adversely and beneficially), those affected by the solution, and those not affected, but particular groups must be sought out. This can be done by self-identification, third party identification, and staff identification. After affected groups have been identified communications is very important. Many techniques are possible depending on size and other characteristics of groups involved, and the information to be communicated from the agency to the public or vice versa. Possibilities for reaching a cross-section of publics are discussed. A compact summary of various media techniques is given. Several examples are given in some detail of public participation sequences which are possible under legislation involving the Corps of Engineers. (Smith - North Carolina)
W76-05652

CRITERIA FOR EVALUATION OF SOCIAL IMPACTS OF FLOOD MANAGEMENT ALTERNATIVES,
Institute of Public Administration, New York.
R. Mack.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 496, $6.00 in paper copy, $2.25 in microfiche. CRSS-NERBC 1.6G, NERBC 1.6B. Prepared for New England River Basins Commission, Boston. Working papers, 1974 146 p, 2 tab, 2 append, 1 plate.

Descriptors: *Cost-benefit analysis, *Management, *Floods, *Flood protection, Water resources planning, *Social impacts, Benefits, Costs, *Connecticut River, Vermont, Massachusetts, Evaluation.
Identifiers: Westfield(MA), North Springfield Reservoir(VT), Utility theory, Flood plain management, Connecticut River Basin, Westfield River(MA), Black River(VT), Brattleboro(VT).

Social impacts, i.e. impacts that are broadly personal and relate largely to social well-being, of floods and flood protection alternatives are not easily put into a common framework like dollars, and a poor person values an extra dollar of income differently than a rich person. Thus a normal benefit/cost framework is difficult to employ. Political processes which should take these intangibles into account are unable to deal with the complexity and subtlety of an integrated multi-means, multi-purpose flood management program. Normal statistics provide little information on social impacts so case studies of extreme situations are used including the North Springfield Dam Project in Black River, Vt. and the Westfield, Ma. flood of 1955. The study proceeds in two steps: (1) On-site detailed chronicles of what happened during selected episodes are garnered from newspapers, interviews and inspection, focusing on desirable and undesirable impacts on people. (2) A system which emulates the benefit/cost analysis is used to tally costs and benefits but this system goes behind dollar measures to the basic utilities. A taxonomy of 9 utility categories was set in an explorative model (e-model) of consumer behavior addressed at optimizing total well-being as envisaged by the household. Findings point out differences in impacts on different groups of people over different periods of time. Attention to social impacts emphasizes the possibility of designing alternatives to improve results with social impact being considered early in the design phase. (Smith - North Carolina)
W76-05653

A STUDY OF PROSPECTIVE WATER POLLUTION CONTROL ACTIVITIES FOR THE OHIO RIVER VALLEY WATER SANITATION COMMISSION (ORSANCO),
Wendell Associates, McLean, Va.
For primary bibliographic entry see Field 5G.
W76-05654

EFFICIENCY IN WATER QUALITY CONTROL FOR THE WILLAMETTE RIVER,
Oregon Univ., Eugene. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05658

MANAGEMENT OF ENVIRONMENTAL QUALITY: OBSERVATIONS ON RECENT EXPERIENCE IN THE UNITED STATES AND THE UNITED KINGDOM,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 5G.
W76-05659

PROPOSAL FOR A TRANS-MEDITERRANEAN AQUEDUCT,
Ottawa Univ. (Ontario).
For primary bibliographic entry see Field 4A.
W76-05660

URBAN WATER MANAGEMENT OF AN INTERNATIONAL RIVER: THE CASE OF EL PASO -JUAREZ,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 3D.
W76-05661

DECISION MAKING AND PLANNING FOR RIVER BASIN DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W76-05752

SOCIAL IMPACTS OF INTEGRATED RIVER BASIN DEVELOPMENT ON LOCAL POPULATIONS,
California Inst. of Tech., Pasadena. Div. of Humanities and Social Sciences.
For primary bibliographic entry see Field 6A.
W76-05755

LONG RANGE PLANNING OF WATER RESOURCES: A MULTI OBJECTIVE APPROACH,
National Water Authority, Budapest (Hungary). Dept. of Water Management Policy.
For primary bibliographic entry see Field 6A.
W76-05760

MULTIPURPOSE RIVER PROJECT PLANNING IN THE LOWER MEKONG BASIN: A DECISION APPROACH,
Economic Commission for Asia and the Pacific, Bangkok (Thailand).
For primary bibliographic entry see Field 6A.
W76-05762

THE MASTER PLAN FOR WATER SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,
Ottawa-Carleton Regional Municipality (Ontario).
For primary bibliographic entry see Field 6D.
W76-05815

EVALUATION OF QUALITY PARAMETERS IN WATER RESOURCE PLANNING: A STATE-OF-THE-ART SURVEY OF THE ECONOMICS OF WATER QUALITY,
Bovet (Eric D.) Alexandria, Va.
For primary bibliographic entry see Field 5G.
W76-05818

SOCIAL IMPACT ASSESSMENT: AN ANALYTIC BIBLIOGRAPHY,
Brown Univ., Providence, R. I.
M. A. Shields.
Army Engineer Institute for Water Resources IWR paper 74-P6, October 1974. 134 p. 40 ref., 3 append.

Descriptors: *Water resources development, *Social impact, *Measurement, *Bibliographies, Social aspects, Analysis, Methodology, Welfare(Economics), Economic impact.
Identifiers: Social impact assessment.

An attempt is made to provide solutions to the problems of analyzing the social impact of water development projects as they relate to demographic impacts, institutional impacts, displacement and relocation, economic impacts (income, employment, taxes), community cohesion, lifestyles, legal dimensions, and differential impacts. A bibliography of material related to these areas of social impact analysis relevant to research, evaluation, and methodology containing 22 references is presented in the following format: Title, author(s), place of publication and other identifying information, locators (the specific geographical area), abstract, and findings which highlight the reviewer's particular interest followed by his comments. Eighteen other references are cited bearing on the subject area of social impact assessment. A tabular presentation of methodological approaches to social impact assessment is included in the introductory section. (Auen-Wisconsin).
W76-05820

SOCIAL SCIENCE DATA BANKS AND THE INSTITUTE FOR WATER RESOURCES,
American Univ., Washington, D.C.
A. B. Motz.
Army Engineer Institute for Water Resources IWR Pamphlet No. 1, July 1974. 48 p. 3 fig., 20 ref., 2 append DACW73-74-C-0027.

Descriptors: *Data storage and retrieval, *Social needs, *Social aspects, Water resources development, Decision making, Comprehensive planning, Information retrieval.
Identifiers: Quality of life, Social indicators.

Presented is an introduction to and description of the scope and value of social science data banks to sociologists, planners, decision makers, and academicians in determining the effect of water resource development on the quality of life, social attitudes, and social values. The data generally contained in social science data banks are (a) standardized enumerations and sample survey data, (b) service-generated data, and (c) professional and nonprofessional reports. The potential of these data banks is discussed in detail--as to how they assist in raising questions, acquire bibliographies, and select methods in which the sociologist can use the data. Usages of data banks can test hypotheses, content analysis, comparative analyses of trends, longitudinal studies, panel studies, cross-cultural studies, contextual analysis, packaged computer programs, simulations, and to generate theories. It is stressed that these data banks must be considered as one of several resources which may be useful in developing prototypes of sample 'aquasystems' (i.e. ecology) in an effort to ascertain their quality of life. The information can provide researchers and planners with quality of life indicators for a specific water-related ecology. They can also serve as a vehicle for the invasion of individual privacy. The appendix identifies several important data banks available to social science researchers. (Auen-Wisconsin)
W76-05822

BENEFIT AND COST ANALYSIS OF HYDROLOGICAL FORECASTS,
World Meteorological Organization, Geneva (Switzerland).
H. J. Day.
WMO No. 341 (Operational Hydrology Report No. 3), 1973. 41 p. 12 fig. 3 tab, 14 ref, 1 append.

Descriptors: *Cost-benefit analysis, *Flood forecasting, *Warning systems, *Flood damage, Flood protection, Mathematical models, Floodproofing, Cities, River forecasting, Flood peak, Flood waves, High flow.
Identifiers: Evacuation, Flood warning time.

An evaluation of the benefits and costs of flood forecasting with regard to flood damage reduction specifically considers the length of warning time, the magnitude of reducible damage, and efficiency of response to a warning. The analytical procedure is based on (1) the economic consequences without any forecasting service; (2) evaluation of the economic consequences when a forecast service is provided; and (3) evaluation of the benefits vs. costs of a forecasting service. A simulation of the Susquehanna River Basin indicated that upon receipt of a warning, benefits will exceed costs. The annual cost of the warning service is based on $100,000, of which approximately one-third, would be associated with residences. Approximately one-fifth to one-third of urban residential flood damage may be reduced by a warning system (when coupled with 100% response). The estimated costs for evacuation and reoccupation vary widely according to the river segment and type of response to the warning. Temporary flood-proofing costs consistently exceeded those of maximum practical evacuation, and limited warning time. Benefit-to-cost ratios varied from 1.0 to 7.5. The results do not include benefits accruing from industrial and commercial damage reductions resulting from a warning system and costs associated with the warning service. (Auen-Wisconsin)
W76-05823

A TECHNIQUE FOR ENVIRONMENTAL DECISION MAKING USING QUANTIFIED SOCIAL AND AESTHETIC VALUES,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5G.
W76-05825

UTAH'S THIRD YEAR OF PLANNING FOR THE FOUR CORNERS REGIONAL COMMISSION,
Utah Planning Commission, Salt Lake City.
Completion Report, September 1971. 49 p.

Descriptors: *Comprehensive planning, *Methodology, *Regional development, Alternative planning, Decision making, Utah, Project planning, Evaluation, Data collections, Mapping, Sites, Arizona, Colorado, New Mexico, Professional personnel, Economic impact, Social aspects, Political aspects, Investment, State governments, Regional analysis, Project benefits, Recreation, Agriculture.
Identifiers: Sevier River Basin(Utah), Utah process, Composite mapping, Comprehensive criterion.

Development by the Four Corners Regional Commission (representing Utah, Arizona, Colorado, and New Mexico) of the 'Comprehensive Criterion' and computer 'Composite Mapping' as planning tools and their efficacy for project evaluation are discussed and demonstrated. The 'Comprehensive Criterion' is designed to define project 'returns' from investment, as related to the effect on the area, and by how much; how it will affect specific income groups, and by how much; the extent of employment opportunities, and by

how much; and the project impact on social and physical environments. 'Composite Mapping' is based on data factors, which is to be enhanced by proximity mapping to define and code areas within any distance of any feature, characteristic of interest, etc., and among its several applications, can be used to define the optimal location of an industry. The Utah State Planning Commission has now begun to integrate administrative agency planning such that each agency will be aware of its impact on the whole State government. This integrated and coordinated planning is designated as the 'Utah Process' and is intended to be used in conjunction with a regional economic model. The results of applying the Comprehensive Criterion to the proposed water and related land resource development project in the Sevier River Basin are demonstrated. (Auen-Wisconsin).
W76-05827

ENVIRONMENTAL IMPACT ASSESSMENT AS AN INSTRUMENT OF PUBLIC POLICY FOR CONTROLLING ECONOMIC GROWTH,
Waterloo Univ. (Ontario). Dept. of Man-Environment Studies.
For primary bibliographic entry see Field 6G.
W76-05828

COMPARATIVE RISK-COST-BENEFIT STUDY OF ALTERNATIVE SOURCES OF ELECTRICAL ENERGY,
Atomic Energy Commission, Washington, D. C.
S. T. Brewer.
Report WASH-1224, December 1974. 250 p. 22 fig., 56 tab., 113 ref.

Descriptors: *Electric power production, *Hazards, *Costs, *Environmental effects, *Public health, Cost comparisons, Electric powerplants, Pollutants, Coals, Oil, Natural gas, Nuclear reactors, Fossil fuels, Efficiencies, Air pollution, Hydroelectric plants, Transportation, Mining.
Identifiers: *Alternate fuel systems.

The societal costs of alternate electrical energy production systems are quantitatively compared, based on a common unit of kilowatt-hours and expressed in dollars, to provide ancillary comparisons and cost-benefit tradeoffs. The entire fuel cycles and their residuals are considered. The systems evaluated are those based on coal, residual fuel oil, natural gas, nuclear fission (LWR) fuels, and hydroenergy. The study is restricted largely to quantification of environmental and human impacts of energy production under normal operating conditions, but certain classes of routine industrial accidents are also treated. 'Costs' include both 'internal' (those already borne by electricity consumers) and 'external' (the environmental and human impacts not accounted for in the price of electricity). The study quantifies effects throughout the respective fuel cycles, from fuel extraction to power generation. The indications are that costs associated with human health and injury, both occupational and public, are less than 1% of the consumers' cost of electricity. External costs, including health, injury, and environmental impacts are less than 3%. These estimates, however, exclude effects of fossil fuel airborne pollutants. The ultimate fuel resource availability is apt to have a greater influence in making choices among energy systems than environmental considerations. The various fuel cycles are described in detail, and their efficiencies and pollution abatement costs compared. (Auen-Wisconsin)
W76-05829

AN ECONOMIC ANALYSIS OF WATER USE IN COLORADO'S ECONOMY,
Colorado State Univ., Fort Collins. Dept. of Economics.
S. L. Gray, and J. R. McKean.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 374, $6.00 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 70, December 1975. 113 p, 31 tab, 8 ref, append. OWRT B-059-COLO(2). 14-31-0001-3265.

Descriptors: *Input-output analysis, Water requirements, Projections, *Optimization, *Colorado, Economics, Industrial water, *Water utilization, Model studies, *Consumptive use, *Estimating, *Income, *Employment, *Water demand, Constraints.

Water use in the Colorado economy is analyzed using an input-output model constructed for this purpose. A detailed description of the Colorado economy showing sales and purchases among 28 processing sectors and 32 total sectors is derived from personal interview, mail questionnaire and secondary data sources. In addition to the basic input-output flows, sector-by-sector estimates of consumptive water use, employment, and value of output are estimated. A further description of the Colorado economy is provided through estimates of multiplier effects on business activity, income, employment and water use. The major purpose is to relate levels of water use, employment and income within the Colorado economy. The use of the input-output framework to analyze alternative scenarios for growth and resource development in Colorado is demonstrated. Condtional forecasts of alternative futures are presented to demonstrate the use of the input-output technique as a tool for policy formulation. A final extension of the model is the conversion to a simplified optimization model incorporating an objective function of maximizing sales to final demads given a restraint placed upon available water supplies for consumptive use. Given annual growth rates for final demand, the linear programming model indicates how far the economy can expand given current technology and the constraint of 6.6 million acre-feet consumptive water use. As growth takes place a change in product mix and increased imputed water values are observed.
W76-05837

MULTI-OBJECTIVE WATER RESOURCES PLANNING: METHODOLOGY TO ACHIEVE COMPATIBILITY BETWEEN ENVIRONMENTAL AMENITIES AND ECONOMIC DEVELOPMENT,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
D. W. York, B. C. Dysart, III, and L. W. Gahan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 377, $7.75 in paper copy, $2.25 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No. 55, May 1975. 212 p, 25 fig, 76 tab, 192 ref, 6 append. S-037-SC, S-048-SC.

Descriptors: *Planning, *Methodology, *Competing uses, Mathematical models, Water management(Applied), Recreation, Optimization, Intangible benefits, Model studies, *South Carolina.
Identifiers: *Multiple objectives, *Economic development, Great Santee Swamp(SC).

A mathematical model of multiple-use in natural areas was developed. The model represents a unified system for the evaluation of cases where traditional forms of economic development such as industrial manufacturing, suburban residential expansion, or mineral extraction are proposed for relatively natural areas having significant environmental amenity values. The model system is a unique benefit-cost analysis that allows for a rational comparison of the costs and benefits associated with both developmental and environment-related activities. The option value has been incorporated into the analysis, and methods have been devised for the estimation of desirability. Desirability serves as the vehicle for the incorporation of amenity-related values into the analysis. Procedures have also been developed for the estimation of the degree of compatibility to impose constraints on the system limiting the levels of utilization of relatively incompatible activities. An elementary form of the gradient optimization algorithm was included to facilitate the search for the most promising management schemes. The model was applied to a study of multiple-use management of the Great Santee Swamp in South Carolina.
W76-05840

INSTITUTIONAL CONSTRAINTS AND CONJUNCTIVE MANAGEMENT OF WATER RESOURCES IN WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W76-05842

SOCIAL ASSESSMENT MANUAL: A GUIDE TO THE PREPARATION OF THE SOCIAL WELL BEING ACCOUNT,
Abt Associates, Inc., Cambridge, Mass.
S. J. Fitzsimmons, L. I. Stuart, and P. C. Wolff.
Prepared for Bureau of Reclamation, Engineering and Research Center, Denver Federal Center, Denver, Colorado, July 1975. 279 p, 19 fig, 3 tab, 16 ref. Bur Reclam 14-06-D-7342 (5)

Descriptors: *Planning, *Evaluation, *Behavior, Data aggregation, Data synthesis, Demography, Human population, Indirect benefits, Long term planning, Optimum development plans, Planning, Political aspects, Public benefits, Social aspects, Social change, Social impact, Social mobility, Social needs, Social participation, Social values, Water policy.

Procedures are presented for conducting research and analyzing data to forecas* probable future impacts of implementing alternative water development plans (or no plan) and assessing their beneficial and adverse social effects upon people and their communities. The procedure produces a Social Well-Being (SWB) Account. The Manual is designed to meet the requirements of the U.S. Water Resources Council's Principles and Standards, which mandate a four-account system to assess water development plans in terms of their Social Well-Being, National Economic Development, Regional Development, and Environmental Quality Effects. The SWB Account is built upon the orientation, theory, research, and methodology of sociology and social psychology, systems analysis, multiple objectives planning, and forecasting. The SWB Account is organized into five components, each containing various evaluation categories with specified data: Individual, Personal Effects (Life, Protection, and Safety, Health, Family and Individual Attitudes, and Environment); Community, Institutional Effects (Demographic, Education, Government Operations and Services, Housing and Neighborhood, Law and Justice, Social Service, Religion, Culture, Recreation, Informal Organizations, and Institutional Viability); Area, Social-Economic Effects (Employment and Income, Welfare and Financial Compensation, Communications, Transportation Economic Base, Planning and Construction); National, Emergency Preparedness Effects (Water Supply, Food Production, Power Supply, Water Transportation, Scarce Fuels, Population Dispersion, Industrial Dispersion, Military, and International Treaties); and Aggregate, Social Effects (Quality of Life, Relative Social Position, and Social Well-Being). Completion of the SWB Account requires five steps: Description of the history of water resources of the area, and of the functions, activities, impact area, and schedule of alternative water plans; Description of the planning area to be affected in terms of its history, present-day social profile, and life-style; Identification of the future social impacts attributable to each alternative plan for each of the components and their evaluation categories; Comparison of the future beneficial and adverse social effects of the alternative plans; and, recommendations of the

plan with optimal future social well-being effects on the plan area. Ultimately, the optimal water development decision will be a function of the combined social, economic, regional, environmental, and regional effects. (Bur Relam)
W76-05993

A PORTFOLIO APPROACH TO PUBLIC WATER PROJECT DECISION MAKING,
Wesleyan Coll., Macon, Ga. Dept. of Business Administration.
W. P. Neely, and R. M. North.
Water Resources Research, Vol. 12, No. 1, p 1-5, February 1976. 6 tab, 12 ref. OWRT A-040-GA (4).

Descriptors: *Water resources, *Projects, *Cost-benefit ratio, *Economic feasibility, Decision making, Planning, Linear programming, Tennessee Valley Authority, Constraints, Budgeting, Systems analysis, Mathematical models.
Identifiers: *Benefit maximization, *Portfolio approach, Integer programming.

Federal water resources projects are presently selected on the basis of the benefit-cost ratio (BCR), which is an indicator of the economic feasibility of individual projects. From this initial feasibility test, one may rank all workable projects by descending BCR to produce a portfolio of feasible projects which maximizes the BCR within a constrained budget. The portfolio approach proposed herein is superior to other approaches for project selection, especially when it is combined with an evaluation system to maximize net present value (NPV). Linear and integer programming techniques are combined with empirical data on Tennessee Valley Authority water resources projects to illustrate the superiority and usefulness of the approach in project selection for implementation. The portfolio approach maximizes NPV and simplifies the application of budget-planning procedures in choosing projects when budget levels are variable or otherwise uncertain. (Bell-Cornell)
W76-05995

EVALUATION OF ECONOMIC BENEFITS FOR FLOOD CONTROL AND WATER RESOURCE PLANNING.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-06083

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COSTS AS A GUIDE TO PRICING,
Sydney Univ. (Australia). Dept. of Accounting.
P. Brown.
Journal of the National Water Well Association of Australia, Vol. 4, No. 3, p. 5-7, September, 1975, 1 tab.

Descriptors: *Construction costs, *Pricing, *Income, *Risks, Income analysis, Cost-benefit analysis, Cost-benefit theory, Cost-benefit ratio, Descriminatory pricing, Direct benefits, Direct costs, Incremental income, Real income, Insurance.

If an element of cost or revenue is unaffected by a particular decision, the, the element can safely be ignored. 'Cost' means 'sacrifice'. Cost refers to future action, not a past action. Some examples: (a) owners salary, were the driller not self-employed in an unincorporated business by other members of the family, use of family car, office in the home, and the telephone, (b) down-the-hole equipment. Revenue means income; the things which are received as a result of some well-specified action. The incremental costs of revenue is the increase in revenue which would result from accepting the job. Fixed costs are irrelevant for one shot pricing purposes. If we drop our prices, on the presumption that fixed costs do not matter, then we will run out of business. (Fuller-NWWA)
W76-05570

SUPPLY AND DEMAND IN WATER PLANNING: STREAMFLOW ESTIMATION AND CONSERVATIONAL WATER PRICING,
Kentucky Water Resources Research Inst., Lexington
For primary bibliographic entry see Field 6D.
W76-05607

WATER'S MOST EFFICIENT SYSTEM.
The American City, Vol. 90, No. 8, p 39-42, August 1975. 5 fig.

Descriptors: *Water distribution(Applied), *Water supply, *Distribution systems, *Reservoirs, *Water costs, Computers, Equipment, Automatic control, Electronic equipment, Economic efficiency, *Texas.
Identifiers: *San Antonio(TX), Edwards Underground Reservoir(TX), Hydrotronics.

Computers, training and business sense help San Antonio (TX) provide quality water at cost-effective rates. Using Edwards Underground Reservoir, one of the world's largest, most pure subterranean water formations, San Antonio serves 160,000 customers. With an initial heavy investment, water supply modernization has resulted in savings of $2.15 million per year plus the lowest fire insurance rate in Texas. A computer saves time and money and serves as a management tool and planning guide. Using a computer control center, the water department monitors all pumping operations and alerts for any change. Other computerized services provide the material supply system with listings of all transactions, daily activities, reporting of personnel, customer service including billing and records at savings of $300,000 annually. Consolidation of the water system's 26 pumping stations is proceeding with projected savings estimated at $470,000 per annum upon completion. Preventive maintenance and equipment replacement as well as the use of hydrotronics for pipeline inspection and an extensive program of meter replacement and testing have produced great savings. On-going training and safety programs reduce lost time and medical claims by employees. (Salzman - North Carolina)
W76-05655

A RURAL MISSISSIPPI SUCCESS STORY: ALCORN COUNTY'S WATER SYSTEM.
For primary bibliographic entry see Field 6D.
W76-05657

LOW COST PHOSPHOROUS REMOVAL,
For primary bibliographic entry see Field 5D.
W76-05786

MINIMAL COST PLANT CLEANING UP HARBOR,
Albertson, Sharp and Backus, Norwalk, Conn.
For primary bibliographic entry see Field 5D.
W76-05796

FINANCING THE NEW WATER AUTHORITIES,
Thames Water Authority, London (England).
E. J. Gilliland.
Water Services, Vol. 79, No. 948, p. 46-54, 1975.

Descriptors: *Public utilities, *Financing, *Cost allocation, Pricing, Rates, Europe, Investment, Income, Loans, Cost repayment, Interest rates, Capital supply.
Identifiers: *England, Service charges.

The complex problems faced by the British regional water authorities related to financing capital improvements under the constraints imposed by the government, public resistance to increased charges, and equitable distribution of service charges, are reviewed. It appears that revenue expenditures for all water authorities will rise in 1975-76 by about 35% over the corresponding figures for 1974-75 and, on an average, so will their various charges. The government's decision to treat water authorities as nationalized industries for capital investment purposes was coupled with the provisions in the Water Act restricting their long term borrowing for capital purposes to the National Loans Fund, for a fixed period at a fixed rate of interest; from the European investment Bank subject to its rules; and from other foreign sources subject to Treasury and Bank of England approval. Their borrowing for 1975-76 will have to be met from the NLF for a 25 year period at the prevailing interest rate. Currently the rate is 17-1/4%. This restricted borrowing has lost interest charge savings from 1-1/2-2% in 1975/76 with losses rising to about 8% over the next five years. (Auen-Wisconsin).
W76-05810

ECONOMIC MAGNITUDES AND ECONOMIC ALTERNATIVES IN LOWER BASIN USE OF COLORADO RIVER WATER,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3A.
W76-05811

MONETARY VALUES OF LIFE AND HEALTH.
Tennessee Valley Authority, Knoxville. Flood Control Branch.
For primary bibliographic entry see Field 6F.
W76-05812

INDUSTRIAL COST RECOVERY AND USER CHARGE ASSESSMENTS,
Bovay Engineers, Inc., Spokane, Wash.
For primary bibliographic entry see Field 5G.
W76-05813

AN ECONOMIC MODEL OF WATER USE AND WASTE TREATMENT,
Houston Univ., Tex.
For primary bibliographic entry see Field 5D.
W76-05814

THE ECONOMICS OF ALTERNATIVE DEEP SEABED REGIMES,
Amos Tuck School of Business Administration, Hanover, N. H.
For primary bibliographic entry see Field 6E.
W76-05816

DETAILED ECONOMIC MODELS FOR INDUSTRIAL AND OTHER ACTIVITIES,
Bari Univ. (Italy).
For primary bibliographic entry see Field 5G.
W76-05817

EVALUATION OF QUALITY PARAMETERS IN WATER RESOURCE PLANNING: A STATE-OF-THE-ART SURVEY OF THE ECONOMICS OF WATER QUALITY,
Bovet (Eric D.) Alexandria, Va.
For primary bibliographic entry see Field 5G.
W76-05818

PRINCIPAL ECONOMIC ASPECTS OF THE PROBLEM OF SALINITY OF THE COLORADO RIVER,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Relaciones Internacionales.
For primary bibliographic entry see Field 6E.
W76-05821

MEASURING AND MINIMIZING THE SOCIAL COST OF ENVIRONMENTAL POLLUTION,
Tennessee Univ., Knoxville. Center for Business and Economic Research.
For primary bibliographic entry see Field 5G.
W76-05824

WILLINGNESS TO PAY AS A BEHAVIOURIAL CRITERION FOR ENVIRONMENTAL DECISION-MAKING,
Waterloo Univ. (Ontario). Dept. of Man-Environment Studies.
For primary bibliographic entry see Field 5G.
W76-05826

UTAH'S THIRD YEAR OF PLANNING FOR THE FOUR CORNERS REGIONAL COMMISSION,
Utah Planning Commission, Salt Lake City.
For primary bibliographic entry see Field 6B.
W76-05827

COMPARATIVE RISK-COST-BENEFIT STUDY OF ALTERNATIVE SOURCES OF ELECTRICAL ENERGY,
Atomic Energy Commission, Washington, D. C.
For primary bibliographic entry see Field 6B.
W76-05829

RESTORING THE QUALITY OF URBAN RECEIVING WATERS: INTERFACING UPGRADED TREATMENT FACILITIES WITH THE STREAM,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W76-05839

LIME USE IN WASTEWATER TREATMENT: DESIGN AND COST DATA,
Brown and Caldwell, Walnut Creek, Calif.
For primary bibliographic entry see Field 5D.
W76-05868

THE ECONOMICS OF CLEAN WATER. VOLUME III. INDUSTRY EXPENDITURES FOR WATER POLLUTION ABATEMENT.
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W76-05951

6D. Water Demand

YUKON CITY'S NEW WELL REPLACES FIVE OLDER ONES,
Hydrogeological Consultants Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 4B.
W76-05566

SUPPLY AND DEMAND IN WATER PLANNING: STREAMFLOW ESTIMATION AND CONSERVATIONAL WATER PRICING,
Kentucky Water Resources Research Inst., Lexington.
D. I. Carey, and C. T. Haan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 159, $7.50 in paper copy, $2.25 in microfiche. OWRT A-052-KY(2), 14-31-0001-4017, 14-31-0001-5017, Research Report No. 92, January, 1976. 174 p, 9 fig, 28 tab, 49 ref.

Descriptors: *Pricing, Water rates, *Water demand, Reservoir storage, *Water supply, *Kentucky, *Reservoir design, Planning, Streamflow forecasting, Estimating, Model studies, Stochastic processes, Hydrologic data.

This study was undertaken to provide methods in water supply reservoir design that increase system benefits. Two major factors influencing reservoir design were studied: estimated future streamflow into the reservoir and demands placed on the reservoir. To assess the reliability of a design, mathematical models were used in simulation studies. A methodology was presented to evaluate the ability of a parametric model to improve the stochastic model parameter estimates. A modified Markov Chain model was proposed which used continuous distributions, rather than discrete transition probabilities, to represent the process when rainfall actually occurred. A two-parameter gamma distribution fit the data. Fifteen-20 years of historical daily rainfall data were required to produce stable estimates of model parameters. The second part of the study was undertaken to see if benefits to a hypothetical community from water supply could be increased by utilizing price-demand information in reservoir design studies. Three pricing policies were examined and their effect on reservoir design determined. The use of the conservation pricing policies substantially reduced storage requirements while providing increased, demonstrable net benefits to the community. The conservation pricing policies substantially lowered the average price paid for water. The effect of uncertainty in consumer response to changes in price was studied by using a probabilitistic price-demand relationship. (Huffsey-Kentucky)
W76-05607

HOW TO GUIDE GROWTH IN SOUTHEASTERN NEW ENGLAND, PARTS I, II AND IV OF THE DRAFT REPORT.
New England River Basins Commission, Boston, Mass. Southeastern New England Study.
For primary bibliographic entry see Field 6G.
W76-05649

A RURAL MISSISSIPPI SUCCESS STORY: ALCORN COUNTY'S WATER SYSTEM.
Appalachia, Vol. 8, No. 4, p 32-39, 14 fig, 1 tab. February-March 1975.

Descriptors: *Water resources development, *Planning, *Water supply, *Regional development, *Water distribution, *Mississippi, Social aspects, Water requirements, *Rural areas, Costs.
Identifiers: *Appalachian Regional Commission(ARC), *Alcorn County(MS), Northeast Mississippi Planning and Development District, *Citizen participation, Local development district(LDD).

Water shortage as well as water pollution has long plagued 866 families of Alcorn County, Mississippi in the northwest Appalachian region of the state. During the 1960's, an industrial and housing boom, as well as several federal and state projects, such as the Tuscumbia River watershed project, triggered an increasing demand on an inadequate water supply. Pump breakdown, dried up wells, contaminated shallow wells and cisterns, bitter water tasting of iron and all-too-frequent water hauling expeditions characterized the old water system. Community action which produced preliminary surveys and engineering studies for feasibility resulted in two plans. The Northeast Mississippi Planning and Development District consolidated the plans and broadened their scope to create the Alcorn County Water Association. The plan consists of a water supply and distribution system in a 70 sq mi area and includes 2 wells, 3 storage tanks and a treatment plant to reduce iron content. Over 100 miles of pipes have been laid. For minimum service monthly bills run to about $6 per family. Financial problems include paying off loan and other debts, lack of new customers as new home construction drops, and high initial cost of installation and connection to main line. However, the growth potential and tenacity and determination of residents are great. (Salzman-North Carolina)
W76-05657

WATER AND ITS ROLE IN THE WORLD (WASSER UND WAS ES IN DER WELT DAMIT AUF SICH HAT),
W. Brecht.
Das Papier, Vol. 29, No. 10A, p V58-61, Oct., 1975. 3 fig, 10 ref. English summary.

Descriptors: *Water supply, Hydrologic data, Natural resources, Water resources, *Water demand.

In a time when questions are being asked as to how man can harmonize the steady increase in his consumption of natural materials with the fact of vanishing world resources, it is striking that water is seldom mentioned. Some data on the world water supply are briefly discussed with respect to the ability to meet future demand. (Speckhard-IPC)
W76-05739

THE MASTER PLAN FOR WATER SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,
Ottawa-Carleton Regional Municipality (Ontario).
F. E. Ayers.
Journal of the American Water Works Association, p. 1-5, January 1975. 5 fig.

Descriptors: *Future planning(Projected), *Water supply, *Water works, Water distribution(Applied), Canada, Cities, *Water demand, *Regional analysis.
Identifiers: Ontario.

A short-term water servicing plan developed by the regional municipality of Ottawa-Carleton to serve an estimated population of 635,000 anticipated to occur by 1990 and a long-term plan based on an anticipated population of 1 million not later than 2030 and not prior to 2000 are described. A study indicated that the most efficient system would be one where the pumping stations were designed to meet the average water demand for the maximum day of consumption with peak hourly rates being met through outflow from reservoirs. The sizing of all water mains has been determined on the basis of imposing the average demand for the maximum day's consumption plus potential fire-fighting flows while maintaining residual pressures at the fire load point of not less than 20 psi. The size of water mains at lower elevations should not exceed 100 psi and at the higher elevations should not be less than 40 psi under all operating conditions except for fire flows. Existing purification plants can be uprated in filter capacity to meet estimated maximum-day demand to 2030. Major pumping station improvements will need to be undertaken and additional storage capacity will be required. The system components are described. (Auen-Wisconsin)
W76-05815

AN ECONOMIC ANALYSIS OF WATER USE IN COLORADO'S ECONOMY,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W76-05837

APPLICATION OF MULTI-REGIONAL PLANNING MODELS TO THE SCHEDULING OF LARGE-SCALE WATER RESOURCE SYSTEMS DEVELOPMENT,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6A.
W76-05846

NORTHERN GREAT PLAINS RESOURCE PROGRAM.
Northern Great Plains Resources Program, Denver, Colo.
Draft Report, Sept. 1974. 163 p, 72 tab, 30 fig, 16 plates.

Descriptors: *Coal mines, *Environmental effects, *Great Plains, *Water resources development, *Water table aquifers, Water storage, Water pollution, Leaching, Wells, Irrigation, Municipal water, Water allocation(Policy), Consumptive use, Water demand, Surface ground water relationships, Water levels, Indian reservation, Water rights, Waste water treatment, Evaporation.
Identifiers: *Northern Great Plains.

Examined in this section are the interrelationships between energy development and water in the Northern Great Plains. Since the plains are semi-arid, much of the readily available water supply is already being used to near capacity, the major consumptive uses being irrigation and evaporation from reservoirs. Thus an extensive energy development program, such as is planned for coal mining in the region, will place strain on the available water supplies and compel the finding of new water sources, even though sufficient water may be available to meet both future agricultural and industrial demands, the price of water will effect its uses. Other factors that must be considered include: (1) municipal water needs; (2) effects on agricultural and wildlife areas; (3) Indian water rights; and (4) ecological effects of mine wastes. The primary consideration up to this time, however, has been the extent to which coal mining may disturb areas of water recharge and alter regional water tables. (Parrish-Florida)
W76-06050

6E. Water Law and Institutions

A CASE STUDY REPORT ON THE VISTULA RIVER BASIN,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-05514

RECENT TRENDS IN WATER QUALITY MANAGEMENT AND PROTECTION IN HUNGARY,
National Water Authority, Budapest (Hungary). Water Pollution Control.
For primary bibliographic entry see Field 5G.
W76-05518

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
For primary bibliographic entry see Field 4A.
W76-05519

VIEWS ON RIVER BASIN DEVELOPMENT IN THAILAND,
Bangkok Metropolitan Water Works Authority (Thailand).
For primary bibliographic entry see Field 4A.
W76-05520

GOALS AND FORMS OF CO-OPERATION AMONG COUNTRIES FOR THE DEVELOPMENT OF INTERNATIONAL RIVER BASINS,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-05521

HISTORY OF GROUND WATER DEVELOPMENT,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W76-05556

JUDGING THE AVAILABILITY OF GROUND WATER.
For primary bibliographic entry see Field 4B.
W76-05558

THE SAFE DRINKING WATER ACT OF 1974: A MANAGEMENT IMPACT STATEMENT.
For primary bibliographic entry see Field 5G.
W76-05656

URBAN WATER MANAGEMENT OF AN INTERNATIONAL RIVER: THE CASE OF EL PASO -JUAREZ,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 3D.
W76-05661

**EFFLUENT DISCHARGE LAW-BURDENS AND CONSEQUENCES FOR THE PAPER INDUSTRY '&
'&
))(ABWASSERABGABENGESETZ-BELASTU'S UND FOLGERUNGEN FUER DIE PAPIERINDUSTRIE),**
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 5G.
W76-05712

STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION,
Crown Zellerbach Corp., Camas, Wash.
For primary bibliographic entry see Field 5G.
W76-05714

REAL-TIME MANAGEMENT OF WATER-RESOURCE SYSTEMS,
Thames Water Authority, Reading (England). Operational Research Unit.
For primary bibliographic entry see Field 6A.
W76-05747

EX-POST EVALUATION OF RIVER BASIN DEVELOPMENTS IN PAKISTAN,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W76-05748

THE CZECHOSLOVAK WATER DEVELOPMENT PLANNING APPROACH AND ITS APPLICATION,
Ministry of Forest and Water Management, Prague (Czechoslovakia).
For primary bibliographic entry see Field 6A.
W76-05749

EVALUATION OF THE EFFECTS OF WATER TRANSFER,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W76-05751

INTER BASIN TRANSFER OF WATER RESOURCE CASE STUDY OF INDUS PROJECT,
West Pakistan Water and Power Development Authority, Lahore.
For primary bibliographic entry see Field 4A.
W76-05753

TECHNICAL-ECONOMIC PLANNING OF THE GABCIKOVO-NAGYMAROS BARRAGE PROJECT FOR THE DEVELOPMENT OF THE CENTRAL-DANUBE BASIN,
National Water Authority, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W76-05754

INTERNATIONAL MANAGEMENT OF THE RIVER PLATE BASIN,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W76-05756

SIMULATION AS A TOOL IN INTERNATIONAL RIVER DEVELOPMENT,
Karlsrube Univ. (West Germany). Institut fuer Wasserbau III.
For primary bibliographic entry see Field 6A.
W76-05757

INTERNATIONAL RIVER BASIN COOPERATION: SOME FACTORS INFLUENCING AGREEMENT,
British Columbia Univ., Vancouver. Westwater Research Centre.
D. LeMarquand.
Working Paper No. 33, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 20 p.

Descriptors: *River basin development, *Agreements, *International law, *Water policy, International commissions, Economics, Hydrology, Navigation, Decision making.
Identifiers: *International cooperation, Developing cuntries, Riparian countries, Economic incentives, Linkage, Reciprocity, Sovereignty.

River systems shared between two or more countries form a significant portion of the world's fresh water resources. These resources are often a vital asset for countries trying to cope with population growth and improving the quality of life. However, political difficulties create real barriers in the way of cooperative use between basin countries and lead to the under-utilization or misuse of these shared resources. This paper attempts to identify the types of consideratons that facilitate or hinder international river agreements. Three ranges of factors are considered: 1) incentives and disincentives influencing cooperation arising from the hydrologic-economic pattern of development within a basin; 2) policy formulation within a national government that is often shaped by a range of international relations influences that a country considers important; and 3) the decision-making process for international rivers within government that may work against effective national participation and commitment in negotiations to settle river basin issues. The above political influences limit the role international commissions and international organizations can have in promoting cooperation; nevertheless, within these constraints, the organizations can perform some functions that facilitate cooperation. These observations are drawn from a general literature review and more detailed studies of five river basins in Europe and North America. Further research is required to gain insights into international river issues in less developed countries. (Bell-Cornell)
W76-05758

LEGAL FRAMEWORK OF CO-OPERATION IN THE FIELD OF WATER MANAGEMENT BETWEEN HUNGARY AND HER NEIGHBORING COUNTRIES,
National Water Authority, Budapest (Hungary).
P. Elemer.
Working Paper No. 34, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 15 p.

Descriptors: *River basin development, *Water management(Applied), *Legal aspects, Riparian waters, Agreements, Water pollution control, Water law.
Identifiers: *International cooperation, *Hungary, *Danube River basin, Tisza Valley.

The Carpathian Basin lies along the middle course of the Danube River. There are six countries shar-

ing the catchment area of the river of about 300.000 km2. The cooperation in the field of water management of the co-basin States is coordinated by bilateral agreements concerning the frontier waters. These agreements regulate the relations of the concerned countries in different fields of water management, such as allocation of water resources, the construction and maintenance of beds of frontier rivers, cooperation in flood control, etc. In all these cases, the implementation of agreements is advanced by joint committees. There are some questions which necessitate the multilateral cooperation of the cobasin States. Thus, there is a cooperation between five countries concerned in the Tisza valley for the checking-up plans for water management. The organization of the cooperation of countries concerned in the Danube Basin is under preparation in the fields of water quality control, setting up of water balance, and flood control. There are special agreements under preparation for planning and executing common water management projects. Among these, the most significant one is the hydroelectric power plant of Gabcikovo-Nagymaros which will be carried out in the framework of Hungarian-Czechoslovakina cooperation. (Bell-Cornell)
W76-05759

WATER RESOURCES DEVELOPMENT IN THE GANGA-GHAGRA INTERBASIN IN UTTAR PRADESH (INDIA),
Central Board of Irrigation and Power, New Delhi (India).
For primary bibliographic entry see Field 4A.
W76-05763

THE ECONOMICS OF ALTERNATIVE DEEP SEABED REGIMES,
Amos Tuck School of Business Administration, Hanover, N. H.
D. E. Logue, R. J. Sweeney, and B. N. Petrou.
Marine Technology Society Journal, Vol. 9, No. 4, p. 8-16, 1975.

Descriptors: *Mining, *Regulation, *Oceans, *Law of the Sea, United Nations, Exploitation, Exploration, Evaluation, United States, Competition, Monopoly.
Identifiers: International Seabed Resource Authority.

The proposals of various sovereign states for an International Seabed Resource Authority debated at the U.N. Law of the Sea Conference are analyzed as to how they impinge on U.S. economic interests. The most economically beneficial is the U.S. Draft Treaty of 1970 which proposed a free-access registry type of ISRA, a first-come-first-served with auction system to settle competing claims. The many foreign proposals for a strong monopoly Enterprise, controlling virtually all aspects of exploration and exploitation, are harmful to U.S. and world economic interest. Many of the Less Developed Countries (LDCs) which are presumed to benefit from such an Enterprise would in fact suffer. The various proposals by the LDCs, France, and the USSR are analyzed with regard to economics and accruing benefits. It is postulated that no need exists for regulation at all. In the foreseeable future, the principal economic activity on the abyssal floor beyond 200 miles from land, or beyond the 3000 m iso-bath, will be nodule mining. On the surface the mining ship is governed by the long-standing maritime rules-of-the-road. The miner's home country could institute needed regulation as it is much more likely to fairly balance the costs and benefits than would an international group that would inevitably be influenced by political ideologies. (Auen-Wisconsin).
W76-05816

PRINCIPAL ECONOMIC ASPECTS OF THE PROBLEM OF SALINITY OF THE COLORADO RIVER,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Relaciones Internacionales.
E. H. Vela Salgado.
Natural Resources Journal, Vol. 15, No. 1, p. 129-133, 1975. 10 ref.

Descriptors: *Colorado River, *Mexico, *Salinity, *Treaties, Arizona, Agriculture, Economic impact, Irrigation effects, Compensation, Water law, *United States, International law.
Identifiers: Mexicali Valley(Mexico).

The increased salinity of the Colorado River water delivered to the Mexicali Valley, Mexico has adversely affected crop production, causing great economic losses; it has raised production costs, and increased research expenditures to develop salinity resistant crops, culminating in permanent repercussions on regional labor sources and public services. Efforts made by the United States to reduce the salinity content of water delivered to Mexico have been ineffective and pursuant to Minute 243 to the Treaty of 1944, signed in 1973, a desalination plant will be built by the U.S. together with an extension of the canal that drains salt water from the Morelos Dam to the Gulf of California. The U.S. is expected to prevent this drainage water from containing radioactive materials or other pollutants. The U.S. is also committed to support Mexican efforts to obtain appropriate financing, on favorable terms, for the improvement and rehabilitation of the Mexicali Valley and to give 'non-reimbursable' technical assistance. Mexico is abandoning its right to claim idemnification due for past damages and appears to be resigned to accepting the promise of loans and nonpayable assistance but fears are expressed that the drainage canal will contaminate the Gulf of California. The U.S. lagging efforts to alleviate the problem are criticized. (Auen-Wisconsin)
W76-05821

INSTITUTIONAL CONSTRAINTS AND CONJUNCTIVE MANAGEMENT OF WATER RESOURCES IN WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geography.
O. W. Templer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 379, $10.00 in paper copy, $2.25 in microfiche. OWRT A-029-TEX (1) 14-31-0001-5044 14-3 -0001-6045 Texas Water Resources Center, Lubbock, Technical Report No WRC-76-1, February, 1976. 119 p, 19 fig, 114 ref.

Descriptors: *Water law, *Water right, Hydrologic cycle, Legal aspects, *Conjunctive use, *Texas, Water management(Applied), Arid lands, Social change, *Institutional constraints, Social adjustment.
Identifiers: West Texas.

The critical interaction between existing legal institutions (Texas water law and water rights) and the limited water resources of arid and semiarid West Texas is examined. The legal division of water in various phases of the hydrologic cycle into different classes and recognition of well-defined water rights in the separate phases present problems to the coordinated, efficient use and management of water resources. Conjunctive use and management of interrelated water resources, practiced in only a few states, is generally considered desirable. However, correlated management cannot be effectively accomplished under present Texas law. Many examples of the problems which relate to, or result from, Texas water law are given. Any revision of Texas law, particularly groundwater law, will be difficult to impose, primarily because of the very large number of recognized private water rights and the political power inherent in them. Change can best be achieved through education of water users and the public to desirable alternatives, a lengthy process. Data necessary for operation of conjunctive management systems are generally being acquired, and perhaps someday other water phases can be integrated with surface and groundwater. However, Texas courts and the legislature have sufficient information on the interrelated hydrologic cycle so that prospective water conflicts should be foreseen and avoided. The greatest care must be used in recognition of new types of private water rights or extension of existing rights, because this institutional structure, once established, presents a formidable obstacle to needed change.
W76-05842

INTERIM REPORT ON THE IMPACT OF PUBLIC LAW 92-500 ON MUNICIPAL POLLUTION CONTROL TECHNOLOGY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-05867

ILLINOIS DRAINAGE LAW--THE DOMINANT ESTATE OWNER MAY NOT INCREASE THE RATE OR AMOUNT OF SURFACE WATER RUN-OFF ONTO THE SERVIENT ESTATE BEYOND A RANGE CONSISTENT WITH A POLICY OF REASONABLE USE,
For primary bibliographic entry see Field 4A.
W76-06051

LEGISLATIVE BARGAIN AND THE DOCTRINE OF REPEAL BY IMPLICATION (DISCUSSION OF CASE INVOLVING COLORADO RIVER STORAGE ACT).
For primary bibliographic entry see Field 4A.
W76-06052

THE INTERNATIONAL LAW ASPECTS OF THE GARRISON DIVERSION PROJECT,
S. E. Gaines.
Environmental Law Reporter, Vol. IV; p. 50085-50100, 1974, 16 p.

Descriptors: *Irrigation programs, *Watershed management, *International Joint commission, *Canada, *United States, Federal Government, North America, Boundaries(Property), Interstate compacts, Water law, Irrigation, Water supply, North Dakota, Water pollution, International law, Saline water intrusion, Floods, State governments, Costs, Agriculture diversion.
Identifiers: *Garrison Diversion Project, *Boundary Waters Treaty of 1909, Injunctive relief, Citizen suits.

The Garrison Diversion Project under the Bureau of Reclamation seeks to withdraw water from the Missouri River for irrigation of 250,000 acres of farmland in semi-arid areas of North Dakota. Seventy-five percent of the acreage is situated in the watersheds of the Souris and Red Rivers which flow into Canada. Canada has filed formal complaint with the United States, alleging that the project will subject the Souris River to increased flooding and higher salinity levels, both violations of the Boundary Waters Treaty. To date neither government has sought to place the matter before the International Joint Commission having jurisdiction in the matter. In light of their complications, and waning Congressional support, the author recommends redrafting the project as an international endeavor by both countries. (Gerlach-Florida)
W76-06053

CONGRESS ORDERS MORITORIUM ON GARRISON DIVERSION UNIT.
Environmental Law Reporter, Vol. 5, No. 8, p. 10131-10136 (1975). 6 p, 12 ref.

Descriptors: *Irrigation programs, *Diversion, *Canada, *International law, *Environmental effects, Water pollution, Legal aspects, Legislation, Water law, Project planning, Treaties, Cost-benefit analysis, Water pollution sources, Water pollution effects, Water pollution control, Water pollution abatement, Fishkill, Path of pollutants, Turbidity, Eutrophication, Salinity, Saline water intrusion, Irrigation effect, United States.
Identifiers: *Garrison Diversion Project, *Boundary Waters Treaty of 1909, Environmental impact statements.

In June 1975, Congress ordered a temporary halt to the Garrison Diversion Unit (GDU), a massive irrigation project which, when complete, would divert huge quantities of water from Lake Sakakawea into the Souris, James and Sheyenne rivers. Opponents of the Garrison Diversion Unit view the project's environmental impact statement as vague inadequate and perhaps intentionally deceptive, and argue that predicted benefits from the project have been grossly overstated while reported costs have failed to take into account detrimental environmental effects. These opponents call for more extensive studies to determine the true cost-benefit ratio. Even greater opposition to the project comes from Canada. Canadians claim the project could cause sever adverse effects to the Canadian environment in the form of increased water salinity, increased turbidity, and depleted gamefish populations. The way in which the Department of the Interior resolves or fails to resolve the GDU project in the coming months will influence Canadian-American relations in the future. (Nursey-Florida)
W76-06054

THE TAKING ISSUE: POTENTIAL OBSTACLE TO NATURAL RESOURCE MANAGEMENT LEGISLATION,
Oregon Univ., Eugene. School of Law.
R. Benner.
Oregon L Rev, Vol. 54, No. 1, p. 67-79 (1975), 13 p.

Descriptors: *Legal aspects, *Oregon, *Constitutional law, *Eminent domain, *Resources development, Regulation, State governments, Legislation, Local governments, Water law, Water resources, Development, Management, Water management(Applied), Planning, Natural resources, Resource allocation, Water quality, Water quality control, Water policy, Water rights, Administration, Governments, Environmental effects, Water quality.
Identifiers: Coastal management.

Debated here is whether a regulatory scheme created under natural resource management legislation can so encumber the use of property as to constitute an unconstitutional taking of the property without compensation. In most cases, as long as the legislation protects the health, safety or welfare of the people and the regulation is not clearly unreasonable or arbitrary, it should be valid. However, if the regulation causes such a diminution in the value of the affected property that no reasonable use of the property remains, the court may find an unconstitutional taking. No court, as yet, has established a fixed percentage of value loss constituting a taking. As environmental awareness grown, regulations implemented for environmental purposes are more likely to be found reasonable and, therefore, constitutionally valid. In order to avoid constitutional difficulties, drafters of natural resource management legislation should avoid regulations which appear to regulate property solely for public purposes, since legislation supported by specific ecological data is more likely to overcome a taking claim. (Nursey-Florida)
W76-06055

THE WASHINGTON SHORELINE MANAGEMENT ACT,
For primary bibliographic entry see Field 5G.
W76-06056

COASTAL ZONE MANAGEMENT AND INTERGOVERNMENTAL COORDINATION,
Louisiana State Univ., Baton Rouge. Law School.
M. J. Hershman, and J. C. Folkenroth.
Oregon Law Rev, Vol 54, No 1, p 13-33 (1975). 82 ref.

Descriptors: *Comprehensive planning, *Governmental interrelations, *Resources development, *Coordination, *Federal-state water rights conflicts, Legal aspects, Legislation, Federal government, State governments, Local governments, Water law, Competing uses, Water resources development, Management, Water management(Applied), Planning, Natural resources, Resource allocation, Water quality, Water quality control, Water policy, Administration, Water utilization.
Identifiers: *Coastal Zone Management Act of 1972, Interagency coordination.

State resource management agencies have had difficulty resolving conflicts among competing resource uses because such agencies traditionally have been responsible only for specific resource problems. The 1972 Coastal Zone Management Act (CZMA) provides opportunities for state governments to receive federal funds to aid in developing coordinated management programs for coastal zone land and water use. Although CZMA should aid in creating more effective state coastal zone management, its effect may be diminished by inadequate funding and conflicts with other federal agencies. The program must coexist with federal laws and programs which directly concern coastal resource management. Whenever federal law directly conflicts with a state's coastal zone management program, the state program must yield to federal law. When these conflicts are not irreconcilable, however, the interagency coordination clauses of CZMA require that federal activities be conducted consistently with approved state programs to the maximum extent practicable. (Nursey-Florida)
W76-06057

REFORMING PROCEDURES FOR INDUSTRIAL SITING,
J. T. Greene.
American Bar Association Journal, Vol. 61, p. 449-452, April, 1975.

Descriptors: *Sites, *Decision making, *Industrial plants, *Land use, *Environmental effects, Legal aspects, Economic feasibility, Social values, Environmental Protection Agency, Governmental interrelations, Adoption of practices, Regulation, Administrative agencies, Administrative decisions, State governments, Federal governments, Jurisdiction, Coordination, Construction, Economic impact.
Identifiers: *Council of Environmental Quality, Reform, Generating plants, Hearings.

This article is a study by the American Bar Association Special Committee on Environmental Law outlining legal reforms needed in the decision-making process in industrial siting. Good, comprehensive, coordinated legal mechanisms for arriving at siting decisions are lacking in almost every state, resulting in inordinate delays in industrial development and inadequate protection of the environment. The study's primary recommendation is that a single state agency should have jurisdiction over all applications to site major industrial facilities. This would eliminate the duplication of hearings and permit applications that currently prevails. Agency decisions would be subject to review by the highest appellate state court. They would be made after due consideration and balancing of all relevant factors, environmental, social, and economic. A similar agency should be created on the federal level to review the siting decisions of federal agencies. The study also recommends that when both federal and state permits are required for a project, a single environmental evaluation should be conducted. (Parrish-Florida)
W76-06058

CERTAIN LAND USE REGULATIONS TO PROTECT FROM DANGER OF FLOODING.
Nags Head Town Council, Nags Head, N.C.
For primary bibliographic entry see Field 6F.
W76-06059

SUGGESTED PROVISIONS TO BE USED IN ZONING ORDINANCES FOR COMPLIANCE WITH SECTIONS 1910.3(C) OF THE NATIONAL FLOOD INSURANCE PROGRAM.
For primary bibliographic entry see Field 6F.
W76-06060

CORPS ISSUES INTERIM RULES FOR DISCHARGES OF DREDGED AND FILL MATERIALS.
For primary bibliographic entry see Field 5G.
W76-06061

ALASKA OIL POLLUTION REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06062

STATE WATER QUALITY CONTROL FUND.
For primary bibliographic entry see Field 5G.
W76-06063

CLEAN WATER GRANT PROGRAM.
For primary bibliographic entry see Field 5D.
W76-06064

WASTE DISCHARGE REPORTS AND REQUIREMENTS.
For primary bibliographic entry see Field 5G.
W76-06065

CERTIFICATION OF CONFORMANCE WITH WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 5G.
W76-06066

MICHIGAN WASTEWATER REPORTING AND SURVEILLANCE FEES RULES.
Michigan Dept. of Natural Resources E. Lansing. Water Resources Commission.
For primary bibliographic entry see Field 5G.
W76-06067

MICHIGAN WATER RESOURCES COMMISSION ACT.
For primary bibliographic entry see Field 5G.
W76-06068

REGULATIONS PERTAINING TO WASTE DISCHARGE PERMITS.
For primary bibliographic entry see Field 5G.
W76-06069

DEPOSIT OF MOTOR VEHICLE BODIES AND ACCESSORIES INTO THE WATERS OF THE STATE.
For primary bibliographic entry see Field 5G.
W76-06070

REGULATIONS PERTAINING TO OIL SPILLS INTO PUBLIC WATERS.
For primary bibliographic entry see Field 5G.
W76-06071

CONFINED ANIMAL FEEDING OR HOLDING OPERATIONS.
For primary bibliographic entry see Field 5G.
W76-06072

STATE FINANCIAL ASSISTANCE TO PUBLIC AGENCIES FOR POLLUTION CONTROL FACILITIES.
For primary bibliographic entry see Field 5G.
W76-06073

SOUTH DAKOTA WATER POLLUTION LAW.
For primary bibliographic entry see Field 5G.
W76-06074

SOUTH DAKOTA ENVIRONMENTAL POLICY ACT.
For primary bibliographic entry see Field 5G.
W76-06075

SOUTH DAKOTA WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 5G.
W76-06076

UTAH WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 5G.
W76-06077

UTAH DEFINITIONS AND GENERAL REQUIREMENTS.
For primary bibliographic entry see Field 5G.
W76-06078

NEBRASKA LIVESTOCK WASTE CONTROL REGULATIONS.
For primary bibliographic entry see Field 5G.
W76-06079

SUBMERGED LANDS LEGISLATION AFFECTING GUAM, THE VIRGIN ISLANDS, AND AMERICAN SAMOA (HR 11559).
Hearing--Subcomm. on Territories and Insular Affairs, Comm. on Interior and Insular Affairs, U.S. Senate, 93rd Cong, 2d Sess, June 19, 1974. 41 p.

Descriptors: *United States, *Virgin Islands, *Legislation, *Boundaries(Property), *Beds, Ownership of beds, Legal aspects, Water law, Water rights, Federal government, Governmental interrelations, Jurisdiction, Federal jurisdiction, Foreign waters, International law, Tidal marshes, Islands.
Identifiers: Congressional hearings, *Guam, *American Samoa, Coastal zone management, Coastal waters.

This hearing before the Senate Committee on Interior and Insular Affairs considers a bill which would transfer to the territories of Guam, the Virgin Islands and American Samoa all right, title and interest of the United States to tidelands and submerged lands surrounding the three territories, with certain specified exceptions. Presented are reports from the Interior, Navy and Justice Departments which generally support the bill. However, the Department of the Navy objects to one section of the bill which would permit the Secretary of the Interior to convey certain lands without the approval of the Secretary of Defense. An amendment is therefore proposed. Delegates from the affected territories present other favorable testimony. The hearing concludes with a recommendation for passage of the bill with the Navy amendment. (Nursey-Florida)
W76-06080

TO AMEND THE WILD AND SCENIC RIVERS ACT (ON S. 10 AND S. 1004).
Hearing--Subcomm on Environment and Land Resources, Comm. on Interior and Insular Affairs, US Sen, 94th Cong, 1st sess, July 6, 1975. 39 p, 2 map.

Descriptors: *Wild and Scenic Rivers Act, *Rivers, *Legislation, *Conservation, Water resources development, Legal aspects, Water law, Water quality, Water quality control, Natural resources, Fishing, Federal government, Local governments, Water conservation, Water management(Applied), Recreation, Navigable rivers, River regulation, Interstate rivers, Wild rivers, River systems.
Identifiers: Congressional hearing, Senate Subcommittee on the Environment of Land Resources, *Allegheny River, *Housatonic River.

The United States Senate Committee on the Environment and Land Resources held a hearing to discuss proposed legislation to add the Housatonic River and a section of the Allegheny River to the National Wild and Scenic Rivers System. The Subcommittee received letters from the Department of the Interior stating that the Department had no objectives to the proposed bills. Statements were received from the sponsors of the bills, Senators Ribicoff and Scott, and from river conservation groups generally supporting the bills. The Subcommittee also received a statement from Representative Moffett from the Sixth Congressional District of Connecticut stating his opposition to the bill affecting the Housatonic River. Representative Moffet's position was that protecting the river could be accomplished best on a local level. (Nursey-Florida)
W76-06081

THERMAL PROCESSING AND LAND DISPOSAL OF SOLID WASTE.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-06082

EVALUATION OF ECONOMIC BENEFITS FOR FLOOD CONTROL AND WATER RESOURCE PLANNING.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-06083

DESIGNATION AND DETERMINATION OF REMOVABILITY OF HAZARDOUS SUBSTANCES FROM WATER.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06084

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY--EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06085

PLASTICS AND SYNTHETICS POINT SOURCE CATEGORY (PROPOSED EFFLUENT LIMITATIONS AND GUIDELINES).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06086

STATE V. GRIFFITH (PRIVATE CLAIM TO TIDELANDS).
216 SE2d 765-767 (S Ct SC 1975). 3 p.

Descriptors: *Boundary disputes, *Ownership of beds, *South Carolina, *Boundaries(Property), *Judicial decisions, Legal aspects, State governments, Water law, Navigable waters, Bodies of water, Tides, Tidal effects, High water mark, Low water mark, Riparian rights, History, Tidal waters, Real property.

The State of South Carolina appealed from a judgement sustaining a private landowner's claim to an area of tidelands adjacent to a creek. The private landowner claimed title under a grant given one of his forebears by the Lords Proprietors in 1717. South Carolina contended that title to the tidelands in question had not been conveyed by any such grant and thus remained in the state. The Supreme Court of South Carolina held that, where no plat was attached to the grant which gave as a boundary a tidal navigable stream, and where no language in the grant signified a specific intent to convey title to any land below the usual high-water mark, the grant was insufficient in and of itself to convey title to the disputed tidelands. (Nursey-Florida)
W76-06087

WILLIAMS V. DUKE POWER CO. (SILTING OF STREAM, PONDS, AND LAKE).
216 SE2d 482-487 (Ct. App. N.C. 1975). 6 p.

Descriptors: *Adjacent land owners, *North Carolina, *Negligence, *Judicial decisions, *Water pollution effects, Legal aspects, Penalties(Legal), Water law, Legal review, Utilities, Water pollution sources, Water pollution, Pollutants, Vegetation, Surface water, Drainage, Silting, Surface drainage, Running waters, Drainage water.
Identifiers: Liability.

Plaintiff landowners brought an action against defendant power company for damage caused by silting of stream, lake and ponds on plaintiffs' land. Plaintiffs contended that defendant failed to use due care in the clearing of adjacent land, thus causing loose soil, debris and trash to enter the waters on plaintiffs' property. The jury determined that the defendant did not cause or permit any materials to go onto plaintiffs' property which would not have been carried by the normal flow of surface waters from the upper to the lower lands. Plaintiffs appealed, assigning as error the trial court's exclusion of testimony by plaintiffs' witness that it was not necessary for defendant completely to defoliate the adjacent land area. The Court of Appeals of North Carolina held this testimony was not admissible because plaintiffs failed to contend that the defendant power company destroyed all natural vegetation on its right-of-way. (Nursey-Florida)
W76-06088

OBSTRUCTION OF STREAMS OR LAKES BY FYKE NETS OR OTHER DEVICES.
La. Rev. Stat. Ann, Sec. 329 (Supp. 1975). 1 p.

Descriptors: *Administrative agencies, *Louisiana, *Legislation, *Fish, *Fish barriers, Legal aspects, Water law, Conservation, Wildlife, Fish migration, Bodies of water, Water management(Applied), Regulation, Nets, Fish conservation.
Identifiers: *Free passageway(Fish).

This section of the Louisiana revised statutes provides that no person shall obstruct the free passage of fish in any body of water in the State by any means whatsoever. The section shall not apply, however, to water control structures or dams for the retention of water for conservation purposes. In addition, no obstructions shall be set within 500 feet of the mouth of any inlet or pass. Free passageway for fish means a minimum passageway opening of five feet in width extending from the surface to the bottom of the water in the deepest portion of the water. (Nursey-Florida)
W76-06089

SOUTH CAROLINA SCENIC RIVERS ACT OF 1974.
SC CODE Ann, sec. 70.45 thru 70.45.16 (Cumm Supp 1974). 5 p.

Descriptors: *Wild River Act, Water resources development, South Carolina, *Rivers, *Water conservation, Water law, Water quality control, Conservation, Natural resources, Water resources, Recreation, Fish, Wildlife conservation, Management, Regulation, Penalties(Legal), Fish conservation, Scenery, Legislation.
Identifiers: *South Carolina Water Resources Commission.

The following types of rivers are eligible for inclusion in the South Carolina rivers system: Class I, Natural River Areas; Class II, Pastoral River Areas; and Class III, Partially Developed River Areas. A river qualifying for designation as a scenic river shall possess unique and outstanding scenic, recreational, geologic, fish and wildlife, historic or cultural values in addition to relatively unpolluted waters. Designated scenic rivers shall be permanently managed for the preservation or enhancement of such values. After determining that a river has qualified as a scenic river, the State may accept donations of certain lands adjacent to the river system. All those donating land in fee simple may deduct the value of the property from their state income tax. Finally, the South Carolina Water Resources Commission shall formulate comprehensive water and land use plans for the scenic rivers. (Nursey-Florida)
W76-06090

MARINE CONSERVATION ACT, AMENDMENTS.
Miss. Gen. Laws, Chap. 572 (1974). 10 p.

Descriptors: Mississippi, *Legislation, *Aquatic life, *Fishing, *Conservation, Legal aspects, State governments, Federal government, Governmental interrelations, Management, Law enforcement, Penalties(Legal), Water law, Commercial shellfish, Crabs, Oysters, Shrimp, Fish, Beds under water, Commercial fishing, Regulation, Fish management, Water quality, Water quality control.
Identifiers: *Mississippi Marine Conservation Commission, Coastal waters, Coastal zone management.

The Mississippi State legislature has enacted legislation establishing a Marine Conservation Commission with full power to control any matters pertaining to saltwater aquatic life not otherwise delegated to another agency. The executive power of the commission is vested in the Director of Marine Conservation. The Commission is to consist of thirteen members, nine of which will be appointed by the Governor for four year terms. All meetings of the commission will be publicly announced and open to the public. The Commission's powers include: (1) regulation of fishing seasons; (2) setting of size and catch regulations for all types of seafood; (3) acquisition and disposition of oyster shells, seed oysters and other materials necessary to promote the growing of oysters; and (4) promulgation of enforcement procedures and penalties for violations. The Commission may also enter into agreements which would aid in the propagation, protection and conservation of Mississippi seafood. (Nursey-Florida)
W76-06091

LINGO V. CITY OF JACKSONVILLE (AUTHORITY OF CITY TO PUMP SUBTERRANEAN WATER).
552 SW2d, 403-406 (Ark 1975). 4 p.

Descriptors: *Underground streams, *Judicial decisions, *Arkansas, *Eminent domain, *Riparian rights, Water distribution(Applied), Water utilization, Withdrawal, Pumping, Water table, Riparian water loss, Water demand, Municipal water, Diversion, Protection, Water levels, Water rights, Water transfer, Utilities, Legal aspects, Reasonable use.
Identifiers: Underground waters, Subterranean water source.

Riparian landowners appealed from judgement of lower court enjoining city appellee from pumping more than a specified amount of water from a subterranean water source. The Arkansas Supreme Court held that the city's removal of the water to a distant point for sale was not necessarily a subject for eminent domain proceedings, and that the riparian landowners were not foreclosed from showing special damages caused by the city's unreasonable use of the water supply. However, until such a showing is made, the city is a riparian owner exactly the same as appellants, and has an equal right to make reasonable use of the water including withdrawal for sale. The Court concluded, therefore, that the lower court was correct in restricting the amount of water the city could withdraw to a level that would not damage other riparian landowners. (Parrish-Florida)
W76-06092

CALDWELL V. GOLDBERG (DISCHARGE OF EFFLUENT FROM SEWAGE PLANT INTO DRAINAGE DITCH).
330 NE2d 694-697 (Ohio 1975). 4 p.

Descriptors: *Ohio, *Judicial decisions, *Drainage systems, *Drainage effects, Legal aspects, Water law, State governments, Penalties(Legal), Controlled drainage, Drainage water, Water pollution control, Ditches, Water conveyance, Sewage effluents, Sewage, Sewage disposal, Effluents, Discharge(Water), Public lands, Competing uses.
Identifiers: Injunctions(Mandatory), Hazardous substances(Pollution).

Plaintiff agricultural landowners brought action against defendant sewage disposal plant to enjoin defendant from discharging effluent into a ditch built by plaintiffs for agricultural drainage of their land. Defendant contended that the ditch was a public watercourse because it follows the path of natural drainage to the land. Defendant further contended that the injury would be trivial and speculative compared to the expense of constructing the sewage disposal plant. The Supreme Court of Ohio held that the ditch built by plaintiffs was private, not public, since it was not established by action of the county commission nor was it dedicated to public use by plaintiffs. The Court further held that injunctive relief was the proper remedy since the effluent discharge could defeat the very purpose for which the ditch was constructed and plaintiff would have no adequate remedy at law to recover for such a damage. (Nursey-Florida)
W76-06093

OLIVER V. HYLE (TERMINATION OF WATER AND SEWER SERVICES FOR FAILURE TO PAY ARREARAGES DENIAL OF DUE PROCESS).
513 P2d 806-811 (Ore Ct App 1973). 6 p.

Descriptors: *Water users, *Oregon, *Judicial decisions, *Public utilities, *Constitutional law, Legal aspects, Water law, State governments, Local governments, Cities, Water rates, Water supply, Sewerage, Water costs, Water works.

Plaintiff tenants brought a class action against defendant municipal water bureau challenging the constitutionality of defendants' practice of terminating the water services of tenants who refused to pay arrearages incurred by prior occupants of the premises. The Plaintiffs contended that the bureau's actions violated the due process and equal protection clauses of the United States and Oregon Constitutions. The Oregon Court of Appeals found the defendant's actions to be unconstitutional holding that, in the absence of a lien or contract, a regulation is unreasonable and void when it seeks to impose a water service obligation on someone other than the one who actually incurred the debt. Thus the water bureau could not constitutionally use the threat of termination of services to compel tenants to pay arrearages incurred by others. (Nursey-Florida)
W76-06094

COASTAL ZONE MANAGEMENT PROGRAM DEVELOPMENT GRANT.
National Oceanic and Atmospheric Administration, Washington, D.C.
40 Fed Reg 16832-35 (1975). 4 p.
Identifiers: *Coastal zones, *Coastal Zone Management Act.

The National Oceanographic and Atmospheric Administration has amended regulations defining the procedures by which states can qualify to receive development grants for development and management of coastal zones under the Coastal Zone Management Act of 1972. The purpose of the development grants is to assist a state in developing a comprehensive management program in its coastal zone. Amendments are made to the regulations which provide for methods and procedures for application for the initial management program development grant. Details to be included in the application are specified. Also amended are the regulation provisions pertaining to approval of applications. The regulations pertaining to applications for second and third year grants are also amended. The factors that the Secretary may consider in determining eligibility for second and third year grants are specified. Also specified are the details required to be included in an application for a second or third year grat. (Segall-Florida)
W76-06095

ENVIRONMENTAL PROTECTION AGENCY--POULTRY PROCESSING PRODUCTS, PROPOSED PERFORMANCE AND PRETREATMENT STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06096

NAVIGABLE WATERS PROCEDURES AND GUIDELINES FOR DISPOSAL OF DREDGED OR FILL MATERIAL.
For primary bibliographic entry see Field 5G.
W76-06097

WATER QUALITY STANDARDS: OREGON (WITHDRAWAL OF PROPOSED RULE MAKING).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-06098

BARTLEY V. SONE (RIGHT OF INDIVIDUAL TO THE USE OF SPRING WATERS LOCATED WHOLLY ON HIS LAND FOR ANY PURPOSE).
527 SW2d 754-61 (Tex Ct Civ Ap 1975). 8 p.

Descriptors: *Adjacent landowners, *Ditches, *Springs, *Texas, *Groundwater, Groundwater resources, Subsurface waters, Percolating waters, Discharge(Water), Hydrogeology, Overlying proprietor, Running waters, Soil water, Surface-groundwater relationships, Water sources, Adjacent landowners, Judicial decisions, Water law, Irrigation canals, Irrigation ditches, Irrigation practices, Irrigation water, Spring waters.

Plaintiff landowner sought injunctive relief and a declaration of certain rights to use water emanating from a spring upon his property against adjoining landowner. Plaintiff's land contained several springs and these were used to irrigate his property by allowing the water to flow in ditches. Defendant had no springs upon his property but had constructed a ditch to collect the runoff water from plaintiff's ditch. Plaintiff contended he could use this water any way he pleased without having to provide defendant with any water, while defendant argued that plaintiff could only use that quan-

tity of water necessary to irrigate on either side of the ditch. The Texas Court of Civil Appeals held that, in the absence of evidence that the flow of the springs had their source in a subterranean stream, it is presumed that the springs on plaintiff's land were of such a character that plaintiff had the right to use their waters for any purpose, either on riparian or nonriparian land, and that the springs were the exclusive property of plaintiff, who had all the rights incident to them that one might have as to any other species of property. (Welch-Florida)
W76-06099

IN RE: MARINE EQUITIES CORP. V. BIGGANE (TIDAL WETLAND ACT CONSTITUTIONAL AS APPLIED TO APPLICATION FOR PERMIT TO FILL UNDER WATER LAND OFF STATEN ISLAND).
373 NYS2d 622-23 (NY Sup Ct 1975). 2 p.

Descriptors: *Administrative decisions, *Permits, *Landfills, *Wetlands, *New York, Water rights, Water law, Legal aspects, Water permits, Constitutional law, Judicial decisions, Legal review, Shore protection, Legislation, Riparian rights, Water policy, Environmental control, Underwater.
Identifiers: *Tidal wetlands.

Plaintiff corporation sought to compel defendant environmental conservation commissioner to issue a permit allowing plaintiff to fill in certain land under water off the shore of Staten Island. Plaintiff also sought to have the Tidal Wetlands Act which prohibits such a land fill declared unconstitutional as applied because it deprived the corporation of property without just compensation. The Supreme Court, Appellate Division, of New York upheld a lower court decision holding that the evidence supported the grounds upon which the commissioner had denied plaintiff's permit application. After a further determination that the Act was not unconstitutional, the court dismissed plaintiff's appeal. (Welch-Florida)
W76-06100

UPPER HARMONY DITCH CO. V. CARWIN (TREASURER'S DEED INCAPABLE OF EXTINGUISHING DITCH EASEMENT AND WATER RIGHTS UNDER WARRANTY DEED).
539 P2d 1282-85 (Colo. 1975). 4 p.

Descriptors: *Colorado, *Easements, *Ditches, *Maintenance, *Judicial decisions, Trespass, Legal aspects, Land tenure, Real property, Right of way, Water law, Water rights.
Identifiers: Abandonment.

Plaintiff corporation brought an action to enjoin defendant landowners from interfering with the maintenance and repair of a ditch owned by the corporation but which transversed the defendants' land. The plaintiff claimed an easement for the ditch, contending that the defendants' purchase of the land in question subsequent to the plaintiff's purchase did not extinguish the plaintiff's easement. The trial court granted the injunction. On appeal, the defendants contended that the treasurer's deed by which they had obtained the land created a virgin title which extinguished the plaintiff's prior rights. The defendants also contended that the corporation had abandoned the ditch since no use had been made of it for several years. The Colorado Supreme Court rejected both of these contentions, however, holding that the treasurer's deed did not extinguish the corporation's rights, since an easement is a separate interest in real property. The court also held that non-use only establishes a presumption of abandonment, and that the plaintiff had entered sufficient evidence to establish that it had not abandoned the ditch. (Hoffman-Florida)
W76-06101

STORY V. HEFNER (DEEDS PURPORTING TO DIVIDE LAKE IN HALF INEFFECTIVE TO PROHIBIT USE OF ENTIRE SURFACE FOR RECREATIONAL PURPOSES).
540 P2d 562-70 (Okla. 1975). 9 p.

Descriptors: *Adjacent landowners, *Oklahoma, *Lakes, *Reasonable use, *Easements, Legal aspects, Judicial decisions, Fishing, Skiing, Water sports, Contracts, Recreation, Riparian rights, Littoral, Water policy, Water utilization.
Identifiers: Easement by implication, Quitclaim deeds.

Plaintiff landowner had owned a lake as tenants in common with the defendant. The plaintiff subsequently brought suit to enjoin defendant from using half the of the lake, contending that the defendant had exchanged quitclaim deeds with him dividing the lake into two individually owned tracts. After a decision granting the relief sought, the defendant appealed. The defendant contended that the quitclaim deeds did not give each party exclusive right to the use of the lake, since the continued use of the lake was the consideration for the deeds. As proof of this contention, the defendant relied on a separate agreement presented at the trial whereby both parties agreed to allow each other the common use of the lake. In reversing the trial court, the Oklahoma Supreme Court found that the separate agreement created an easement to the entire lake by implication. The court held that the granting of the easement did not have to satisfy the Statute of Frauds, since an easement implied from pre-existing use may be established by parol evidence. Furthermore, a reasonable necessity is sufficient to establish an easement by implication. In this case, the lake was primarily used for fishing and skiing, and thus the use of the entire lake surface was a reasonable necessity. (Hoffman-Florida)
W76-06102

WILBER V. WESTERN PROPERTIES (WHETHER AN ARTIFICIALLY ALTERED WATERCOURSE IS A NATURAL OR ARTIFICIAL CHANNEL A MATTER OF LAW).
540 P2d 470-74 (Wash. Ct. App. 1975). 5 p.

Descriptors: *Washington, *Drainage systems, *Flooding, *Watercourses(Legal aspects), *Storm drains, Judicial decisions, Artificial watercourses, Ditches, Channels, Penalties(Legal), Water management, Natural streams, Adjacent land owners, Damages.
Identifiers: *Abandonment.

Plaintiff apartment house owner brought an action against defendant adjacent land owners seeking damages for the flooding of his apartment house allegedly caused by the negligent operation of the defendants' drainage system. The plaintiff was also seeking an injunction for nuisance abatement. After the trial court awarded a damage verdict and denied injunctive relief, both parties appealed. The defendants contended the trial court erred in refusing to allow the jury to make factual determinations as to whether the defendants' open ditch system constituted a natural or an artificially constructed drainage system for the area. They also contended that the jury should have decided if the open ditch was an abandoned method of storm drainage. The Washington Court of Appeals denied both contentions, however, holding that the question of whether an artificially altered watercourse has become a natural channel is a matter of law to be decided by the court. The court also found that the defendants had not introduced sufficient evidence to prove that the ditch was abandoned. As to the plaintiff's cross appeal concerning the denial of injunctive relief, the court found that a careful balancing of the equities involved supported the trial court's decision. (Hoffman-Florida)
W76-06103

SHAUB V. FIFTH JUDICIAL DISTRICT (ADJUDICATION OF WATER RIGHTS IN MAIN STREAM ALSO AN ADJUDICATION OF RIGHTS IN TRIBUTARIES),
539 P2d 277-80 (Idaho 1975). 4 p.

Descriptors: *Idaho, *Diversion, *Relative rights, *Stream flow, *Natural flow doctrine, Judicial decisions, Legal review, Legal aspects, Water rights, Riparian rights, Water law, Jurisdiction, Water utilization, Alteration of flow, Water management(Applied).
Identifiers: Injunctive relief.

Plaintiff ranch owner had been enjoined in a previous action from diverting more than a specified amount of water from the Mendini Tunnel stream. The plaintiff was later found to have violated the injunction by diverting water from a stream that is a natural tributary of the Mendini Tunnel. Plaintiff then obtained a writ of review contending that the original injunction concerned the Mendini Tunnel, and not the tributary stream; consequently, the effect of the contempt hearing was an improper adjudication of title to the stream. The plaintiff also contended than an injunction operates as an adjudication only to stay the acts threatened, and cannot prevent acts not prohibited within the injunction. The Supreme Court of Idaho disagreed with both contentions, however, holding that the court had adjudicated only the question of whether the injunction had been violated. Furthermore, the court found that a reasonable construction of the terms of the injunction prohibited the diversion of tributary waters of the Mendini Tunnel for the plaintiff's use. (Hoffman-Florida)
W76-06104

BURTON V. DOUGLAS COUNTY (COUNTY LIABILITY FOR FLOOD DAMAGES TO PROPERTY CAUSED BY FAULTY ROAD CONSTRUCTION).
539 P2d 97-101 (Wash. Ct. App. 1975). 5 p, 1 map.

Descriptors: *Surface drainage, *Washington, *Road construction, *Drainage effects, *Storm runoff, Civil engineering, Drainage area, Drainage systems, Judicial decisions, Surface runoff, Channels, Water spreading, Highway effects, Rainfall, Storm water.

Plaintiff homeowner brought an action against defendant county for damages caused to his home by the construction of a county road. The plaintiff contended that rainfall from a severe rainstorm was channeled and deposited onto his land, causing severe damage to his basement. The trial court dismissed the complaint. In reversing, the appellate court considered two main issues: did the road constitute an artificial channel; and if so, was the county liable regardless of whether the rainstorm was an act of God. The court determined that the road did act as an artificial channel in that a crown in the road caused water which would normally have run across the road to be channeled onto the plaintiff's land. After finding the road to be an artificial channel, the court held that the county was liable regardless of whether the rainstorm was an act of God. The rainstorm would not have damaged the plaintiff's home if it were not for the road; thus, the road was the proximate cause of the damage. (Hoffman-Florida)
W76-06105

STREAM POLLUTION CONTROL BOARD OF STATE OF INDIANA V. UNITED STATES STEEL CORP. (COMMON-LAW PUBLIC NUISANCE ACTION AGAINST STEEL CORP. IN WHICH PRIVATE CITIZEN SOUGHT TO INTERVENE.
512 F2d 1036-1043 (7th Cir. 1975). 8 p.

Descriptors: *Indiana, *Federal Water Pollution Control Act, *Navigable waters, Industrial wastes, Wastes, Environmental effects, Natural resources, Water quality pollutants, Oil pollution,

Legislation, Regulation, Judicial decisions, Federal government, Administration, Water quality control, State governments, Jurisdiction, Legal aspects, Supervisory control(Power), Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Effluent limitations, Public nuisance, Hazardous substances(Pollution).

Plaintiff-appellant, a private citizen, moved to intervene in a public nuisance action brought by a state stream pollution control board against a steel company. The United States District Court for the Northern District of Indiana denied the motion and the plaintiff appealed. His main argument was that the Federal Water Pollution Control Act Amendments of 1972 allowed such intervention. In rejecting this argument, the Seventh Circuit Court of Appeals said that Congress intended this Act to require a step-by-step improvement in quality of discharged effluent, rather than a zig-zag course with total purity demanded forthwith only to be succeeded by various stages of impurity. A private citizen is entitled to intervene if, and only if, the underlying action was commenced to require compliance with a 'standard, limitation, or order' within the meaning of the 1972 Act. Here the complaint of the Board, which sought to abate pollution of the Grand Calumet River, was sufficient to give the District Court jurisdiction to decide whether the Board was entitled to relief under federal common law, but did not bring the action under the 1972 Act. (Parrish-Florida)
W76-06106

RESERVE MINING CO. V. ENVIRONMENTAL PROTECTION AGENCY (ACTION BY U. S. AND MINNESOTA TO PREVENT DISCHARGE OF TACONITE TAILINGS INTO WATER OF LAKE SUPERIOR BY PROCESSING COMPANY).
14 F2d, p. 492-542 (Eighth Circuit 1975). 51p.

Descriptors: *Judicial decisions, *Rivers and Harbors Act, *Federal Water Pollution Control Act, Mine wastes, *Public health, Water pollution, Environmental effects, Mineral industry, Waste dumps, Minnesota, Wisconsin, Michigan, Asbestos, Permits, Legal aspects, Jurisdiction, Lake Superior, Water pollution sources, Waste disposal, Industrial wastes.
Identifiers: *Taconite, Tailings, Hazardous substances(Pollution).

The United States and Minnesota brought an action against defendant mining company to enjoin the discharge of taconite tailings into the waters of Lake Superior. Approximately 67,000 tons of tailings are discharged daily into the lake as a slurry. The United States District Court for the District of Minnesota, after hearing conflicting testimony on the health and environmental hazards presented by the discharges, ordered the closing of defendant's Silver Bay facility. Defendant was found to be in violation of Minnesota water quality standards and the Federal Water Pollution Control Act. The Eighth Circuit Court of Appeals modified the order, giving the defendant a reasonable time to stop discharging wastes into Lake Superior and to find an appropriate land disposal site. Although defendant's discharges were not found to be sufficiently harmful to require an immediate shutdown, the taconite tailings were held to be an illegal discharge of refuse matter in violation of section 407 of the Rivers and Harbors Act. Thus, defendant was turned to use all haste in constructing new facilities to eliminate the discharge of tailings into the lake. (Parrish-Florida)
W76-06107

UNITED STATES V. LEWIS (ACTION TO ENJOIN CONSTRUCTION OF A CAUSEWAY ACROSS A TIDAL MARSH WITHOUT PERMIT REQUIRED UNDER THE RIVERS AND HARBORS ACT).
368 F. Supp. 1132-1143 (S.D. Ga. 1973). 12 p.

Descriptors: *Federal jurisdiction, *Tidal marshes, *Georgia, *Judicial decisions, *Rivers and Harbors Act, Navigable waters, Navigation, Water law, Navigable rivers, Riparian rights, Land tenure, Federal government, Regulation, Jurisdiction, Legal aspects, Administrative agencies, Legislation, Law enforcement, Non-structural alternatives, Permits, Water rights, Marsh management, Marshes.
Identifiers: Fill permits, Injunctive relief, Navigational servitude, Navigation obstructions.

The United States Corps of Engineers brought on action in federal district court to permanently enjoin the defendant landowner from filling certain tidal marshland and to compel removal of fill and debris already deposited. The defendant had almost completed a causeway across the marshland from his property to a nearby creek. The government contended that the fill was within navigable waters since the affected marshland was adjacent to a navigable creek thus making the defendant in violation of provisions of the Rivers and Harbors Act by failing to obtain a Corps permit. The defendant argued that, (1) the creek was not a navigable water, (2) the federal government lacked jurisdiction over the marshland, (3) such regulation constituted a taking of his property without due process of law and (4) the government was estopped to complain because it had full knowledge of his actions yet permitted him to continue. The court held that the marshland was below the original high water marsh subject to inundation by mean high waters and thus was subject to federal regulatory jurisdictions. The defendant was held in violation of the act and an injunction issued. Further proceedings were ordered regarding the removal of the fill already deposited. (Deckert-Florida)
W76-06108

UNITED STATES V. FLORIDA (PROCEEDING SEEKING DEFINITION OF SEAWARD BOUNDARY OF SUBMERGED LANDS OF CONTINENTAL SHELF).
95 S. Ct. 1162-1164, (1975). 3 p.

Descriptors: *Florida, *Boundary disputes, *Gulf of Mexico, *Submerged Lands Act, *Judicial decisions, *Federal-state water rights conflicts, Legal aspects, *Atlantic Ocean, State governments, Federal government, Water law, Legislation boundaries(Property), Beds, Beds under water, Continental shelf, Tidal waters, Aquatic soils.
Identifiers: *Florida Bay, Juridicial bay.

Plaintiff federal government sought a decree defining the seaward boundaries of submerged lands of the continental shelf in the Atlantic Ocean and Gulf of Mexico in which Florida has the right to natural resources. The issue was referred to a special master who recommended recognizing a portion of Florida bay as a 'juridicial' bay and drawing 'closing lines' around three groups of islands which comprised the Florida keys. The United States took exceptions to these findings which were made without the benefit of arguments raised by both parties on appeal. The Supreme Court referred these exceptions to the special master for consideration. (Jenkins-Florida)
W76-06109

BUTLER V. BRUNO (DEFLECTION OF SURFACE WATERS).
341 A2d 735-742 (RI 1975). 8 p.

Descriptors: *Rhode Island, *Diversion, *Surface drainage, *Reasonable use, *Judicial decisions, Legal aspects, Adjacent landowners, Common law, Legal review, Penalties(Legal), Water law, State governments, Drainage, Surface runoff, Drainage water, Overland flow, Drainage systems, Running waters, Drainage effects, Controlled drainage, Surface waters, Damages.
Identifiers: Common enemy rule, Rule of reasonable use.

Plaintiff landowners brought suit against defendant adjoining landowner to recover damages resulting from defendant's deflection of surface water from his property onto plaintiffs' premises. The trial court held in favor of defendant based on the 'common-enemy doctrine' under which each landowner has an unlimited privilege to deal with surface waters, without regard to consequences that might be suffered by his neighbors. On appeal, the Supreme Court of Rhode Island held that the trial court erred in applying the 'Common-enemy doctrine' and that the rule that should have been applied was that of 'reasonable use'. Under this rule the liability of a property owner in draining his land depends on the reasonableness of his actions. This presents a question of fact to be determined upon consideration of the circumstances in each case. Relevant factors to be considered include: (1) the necessity for the drainage; (2) the degree of care taken to avoid injury to the land receiving the water; (3) the benefit accruing to the land drained; and (4) the availability and feasibility of artificial drainage systems. Since none of these factors had been considered, plaintiff's appeal was sustained and the case remanded. (Nursey-Florida)
W76-06110

STATE V CORVALLIS SAND AND GRAVEL CO. (AVULSION: NEWLY SUBMERGED LANDS TITLE IN FORMER OWNER BUT PARAMOUNT NAVIGATIONAL SERVITUDE IN STATE).
526 P2d 469-87 (Ore. Ct. App. 1974). 19 p, 1 map.

Descriptors: *Oregon, *Judicial decisions, *Ownership of beds, *Accretion, *Navigable water, Legal aspects, Water law, Common law, State governments, Water rights, Dredging, Navigable rivers, Navigation, Bodies of water, River beds, Fishing, Running waters.
Identifiers: Navigational servitude, Avulsion.

Plaintiff, State of Oregon brought an action in ejectment against defendant gravel company to recover possession of land which was part of the bed of a navigable river. The land in dispute became submerged after the river started to flow through a new channel. Defendant was the owner of the land at the time it became submerged. Plaintiff contended that ownership of the land passed to the State under the law pertaining to accretion. Defendant argued that the change in river flow which submerged the land was sudden and avulsive and therefore, that defendant remained the owner of the land under an exception to the accretion principle. The Court of Appeals of Oregon held that the change in river flow was avulsive; therefore, defendant was the owner of the land. However, since the land was part of the bed of a navigable river, the State held a paramount navigational servitude for the purpose of controlling navigation, fishing and other related public goals. (Nursey-Florida)
W76-06111

CITY OF LOS ANGELES V. RICARDS (FLOOD DESTRUCTION OF PRIVATE BRIDGE CAUSES LOSS OF ACCESS AND DEPRECIATION OF PROPERTY VALUE-INVERSE CONDEMNATION).
515 P2d 585-89 (Cal. 1973). 5 p.

Descriptors: *Real property, *California, *Judicial decisions, *Eminent domain, *Bridges, Legal aspects, Water law, State governments, Local governments, Penalties(Legal), Easements, Construction, Condemnation, Access routes, Flow, Diversion.

Plaintiff landowner brought an action in inverse condemnation against defendant City of Los Angeles for damage incurred by the destruction of a bridge over which plaintiff held an easement and which constituted the sole access to plaintiff's property. Plaintiff contended that the bridge was destroyed by waters which were diverted by mu-

nicipal construction at a point upstream from plaintiff's property. Plaintiff remained without access to her property for two years until a new bridge was constructed. The California Supreme Court held that the destruction of the bridge constituted a taking of plaintiff's property for which plaintiff was entitled to compensation. However, the court went on to find that the property was held by plaintiff for speculation and investment and that plaintiff had no intention of selling the property within the two year period required to construct the new bridge. Plaintiff had, therefore, suffered no financial disadvantage and was not entitled to substantial damages for the loss. (Nursey-Florida)
W76-06112

LANNING V. STATE HIGHWAY COMMISSION (FLOOD DAMAGE BY DEBRIS COLLECTED IN FRONT OF BRIDGE PIERS).
515 P2d 1355-59 (Ore. Ct App 1973). 5 p.

Descriptors: *Oregon, *Piers, *Negligence, *Flood damage, *Bridges, Legal aspects, Water law, State governments, Penalties(Legal), Structures, Maintenance, Bodies of water, Judicial decisions, Floods, Real property.
Identifiers: Sovereign immunity, Liability(Legal), Proximate causation.

Plaintiffs landowners brought an action against defendant State of Oregon for damage caused to plaintiffs' land by flooding. Plaintiffs contended that defendant was negligent in failing to remove accumulated debris from state bridge piers. This accumulated debris caused the flooding of plaintiff's land. The State argued that the decision to remove or not remove the debris was a discretionary state function for which the state was immune from liability. The Court of Appeals of Oregon held that maintenance of the piers was not a discretionary function. The state had a duty to maintain its bridge piers and was therefore liable to plaintiffs for failing to remove the debris which caused the flood damage to plaintiffs' land. (Nursey-Florida)
W76-06113

GOOSE CREEK HUNTING CLUB, INC. V. UNITED STATES (DAMAGES FOR GOVERNMENT'S TAKING OF PERMANENT FLOWAGE EASEMENT).
518 F2d 579-84 (Ct Cl 1975). 6 p.

Descriptors: United States, *Judicial decisions, *Eminent domain, *Navigable waters, Legal aspects, Water law, Constitutional law, Federal government, Navigation, Rivers, River beds, Bodies of water, Non-navigable waters, Water levels.
Identifiers: *Navigational servitude.

Plaintiff landowner brought an action against the United States Government for an alleged taking of plaintiff's property adjacent to a non-navigable creek. Plaintiff contended that the government's action in raising the minimum water level in a nearby navigable river raised the minimum level in the non-navigable creek adjacent to plaintiff's land thereby flooding the land. The Court of Claims held that, although the government is not liable for water damage caused to land within the bed of a navigable river, when that damage results from improvements of navigable waters, the government is liable for damage to land outside the bed of the river. Since plaintiff's land bordering on a non-navigable creek which flowed into a navigable river was not within the bed of the navigable river, plaintiff was entitled to recovery. (Nursey-Florida)
W76-06114

COMMONWEALTH, DEPARTMENT OF NATURAL RESOURCES V. WESTMORELAND-FAYETTE MUNICIPAL SEWAGE AUTHORITY (APPEAL BY MUNICIPAL ENTITY FROM ORDER TO CURB DISCHARGE OF UNTREATED SEWAGE INTO WATERS OF PENNSYLVANIA.,
336 A2d 704-706 (Commonwealth Ct Penn., 1975). 3 p.

Descriptors: *Pennsylvania, *Municipal wastes, *Sewage disposal, *Sewage treatment, Judicial decisions, Regulation, State jurisdiction, Governmental interrelations, Local governments, Water quality standards, Administration, Constitutional law, Proprietary powers, Streams, Legal aspects, Water law.
Identifiers: *Clean Streams Law, *Environmental Hearing Board, *Due process, Municipal property rights.

The Pennsylvania Department of Environmental Resources (DER) issued orders to four municipal entities directing them to abate the pollution caused by the discharge of untreated and inadequately treated sewage into waters of the Commonwealth in violation of the Clean Streams Law. An appeal of this order made to the Environmental Hearing Board (EHB) was dismissed. Consequently, the municipal entities appealed the EHB decision, contending that a denial of the appellants' due process rights would result from enforcement of the DER orders. Appellants conceded that municipalities have generally been denied the right to assert their due process protections against actions instituted by the sovereign. However, appellants urged that this concept should not be applicable where the municipal property rights 'appropriated' by the state were rights in property used for proprietary, not governmental, purposes. The court relied on a U.S. Supreme Court case that found the governmental/proprietary dichotomy was not relevant in the context of pure state/municipality interactions. Consequently, since this case involved such a pure interaction, the court affirmed the pollution abatement order. (Hoffman-Florida)
W76-06115

6F. Nonstructural Alternatives

COPING WITH FLOOD HAZARD IN NEW BRAUNFELS AND SEGUIN, TEXAS,
Southern Illinois Univ., Carbondale. Dept. of Geography.
D. D. Baumann, and N. A. Simkowski.
In: 'Reservoir Impact Study,' p 3. 1.i-3,3.37, November 1974. 102 p. 4 fig, 21 tab, 61 ref.

Descriptors: *Flood protection, *Flood plain insurance, Adoption of practices, Attitudes, Risks, Surveys, Land use, Local governments, Legal aspects, Property values, Legislation, *Texas.
Identifiers: *Canyon Reservoir(Tex), New Braunfels(Tex), Seguin(Tex), Guadalupe River(Tex).

The role that Canyon Dam on the Guadalupe River may have had in the adoption of flood damage-reducing adjustments at New Braunfels and Seguin, Texas, on the individual and community level, and those factors related to the decisions to purchase flood insurance on an individual basis are identified by evaluating individuals' conative responses. In order to achieve the desired action a program should be designed that would make an appeal based upon cultivating an individual's sense of efficacy in coping with the hazard. The problems involved in how and with what difficulties community decisions are reached in the formulation and implementation of flood-plain regulations were analyzed from the locus of the structure of community power and on the individual characteristics of those who exert influence over the decision. Regulation proposals seem to encounter general public apathy and lack of concern. Most organized participation from the private sector is in the opposition. City officials lack a well-defined methodology to determine a satisfactory scheme and appraise the social and economic consequences ordinances will have on the community. The levels of responsibility and participation of federal, local, and citizens are identified, their roles evaluated, and recommendations for improvements are suggested. (See also W76-04501) (Auen-Wisconsin).
W76-05502

FLOOD HAZARD ANALYSES: BUFFALO RIVER, AMHERST COUNTY, VIRGINIA.
Soil Conservation Service, Richmond, Va.
For primary bibliographic entry see Field 4A.
W76-05643

FLOOD HAZARD ANALYSES: BLACKS RUN-COOKS CREEK, ROCKINGHAM COUNTY AND HARRISONBURG, VIRGINIA.
Soil Conservation Service, Richmond, Va.
For primary bibliographic entry see Field 4A.
W76-05644

FLOOD PLAIN INFORMATION: ILLINOIS AND MICHIGAN CANAL, ROCK RUN CREEK, THORNE CREEK, JOLIET, ILLINOIS.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-05645

SPECIAL FLOOD HAZARD INFORMATION REPORT: HOWELL CREEK BASIN LAKES, ORANGE COUNTY, FLORIDA,
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-05646

FLOOD PLAIN INFORMATION: COASTAL AREAS, LEVY COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-05647

FLOOD PLAIN INFORMATION: LITTLE MC-MULLEN CREEK, JESUP, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-05648

CRITERIA FOR EVALUATION OF SOCIAL IMPACTS OF FLOOD MANAGEMENT ALTERNATIVES,
Institute of Public Administration, New York.
For primary bibliographic entry see Field 6B.
W76-05653

FLOOD LOSS MANAGEMENT IN DEVELOPING COUNTRIES: A MODEL FOR IDENTIFYING APPROPRIATE STRATEGIES,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6A.
W76-05761

MONETARY VALUES OF LIFE AND HEALTH.
Tennessee Valley Authority, Knoxville. Flood Control Branch
B. Buehler.

Descriptors: *Mortality, *Evaluation, *Project benefits, *Measurement, Safety, Public health, Social values, Income, Risks, Dams, Flood control.

Property damage prevention, though considerable, falls far short of justifying the high cost of flood control projects. Preventing flood-caused death and injury would be the principal project benefit. To substantiate this idea, the preventable loss lifestream of earnings is used to measure human worth to quantify this benefit. The technique ad

vocated evaluates human worth on the worth of an individual to his family in the next-of-kin concept and his/her worth to society in a broader concept. Both the societal and next-of-kin concepts are examined and the next-of-kin evaluation is demonstrated. Three examples show a practical method of computing human worth: (1) For a typical 33-yr old married male, (2) for a 33-yr old housewife (including the use of substitute services), and, (3) for a 12-yr old male child which includes subsistence and educational costs prior to gainful employment. Illustrated also is the strong reducing influence of discounting distant future earnings to present worth. A case study of a resort city, comprised of 26 human groups is summarized showing that their weighted composite values round out to $166,000 for value lost due to death (in 1971 dollars) and $258,000 value lost due to permanent disability. (Auen-Wisconsin)
W76-05812

REGIONAL WATER EXCHANGE FOR DROUGHT ALLEVIATION,
Colorado State Univ., Fort Collins. Hydrology and Water Resources Program.
For primary bibliographic entry see Field 4A.
W76-05819

BENEFIT AND COST ANALYSIS OF HYDROLOGICAL FORECASTS,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 6B.
W76-05823

CERTAIN LAND USE REGULATIONS TO PROTECT FROM DANGER OF FLOODING.
Nags Head Town Council, Nags Head, N.C.
Land Use Ordinance (1975) 3 p.

Descriptors: *North Carolina, *Legislation, *Flood protection, *Flood plain zoning, *Building codes, Legal aspects, Local governments, Water law, Construction, Floods, Flood control, Drainage systems, Water supply, Flood damage, Flood plains, Floodways, Floodproofing, Regulation, Water management(Applied), Maximum probable flood, Flood data, Land, Land use, Land development.
Identifiers: *National Flood Insurance Program.

The town of Nags Head, North Carolina has adopted an ordinance for the protection of structures and inhabitants from the danger of flooding, representative provisions of which include: (1) all new construction of residential structures or substantial improvements of existing residential structures will have the lowest floor elevated to at least the applicable level of the 100-year flood or 9 feet mean sea level; (2) all new construction of non-residential structures or substantial improvement of existing non-residential structures will have the lowest floor elevated to at least the applicable level of the 100-year flood or 9 feet mean sea level, or will be floodproofed up to the applicable level of the 100-year flood; (3) new constructions or substantial improvements on land in 'Coastal High Hazard Areas' below the 100-year flood level will be elevated on adequately anchored piles to a lowest floor level at or above the applicable 100-year flood level or 9 feet mean sea level; (4) all building permit applications for new construction or substantial improvements within 'Special Flood Hazard Areas' will be reviewed to assure that the proposed construction will minimize flood damage; and (5) all new or replacement sewage or water supply systems within 'Special Flood Hazard Areas' shalll be designed and located to minimize infiltration of flood waters and discharges into flood waters. These and other provisions are designed to enable Nags Head to participate in the Federal Flood Insurance Program. (Nursey-Florida)
W76-06059

SUGGESTED PROVISIONS TO BE USED IN ZONING ORDINANCES FOR COMPLIANCE WITH SECTIONS 1910.3(C) OF THE NATIONAL FLOOD INSURANCE PROGRAM.
(1974). 10 p.

Descriptors: *Flood plain zoning, *Land use, *Land classification, *Non-structural alternatives, *Flood proofing, Public health, Beneficial use, Floodways, Administration, Flood protection, Legislation, Maps, Construction, Permits, Reasonable use, Penalties(Legal), Legal aspects, Zoning.
Identifiers: *National Flood Insurance Program.

To prevent unnecessary damage from flood waters, this ordinance would require that all flood plain lands be zoned as either a floodway district or flood fringe district. Land uses in the floodway district would generally be limited to those having a low flood damage potential. Special exemptions could be obtained for other specified uses, however, provided that all floodproofing provisions in other codes were met. Typical uses which could qualify for these exemptions include: streets; bridges; water related uses; and structures accessory to low flood damage potential uses. Also suggested are a list of factors which should be considered by the zoning board when considering applications for exemptions, including: possible danger to life or property; public importance of the proposed land use; availability of alternative sites; and location of the land. In contrast to the extensive regulation of flooding districts, flood fringe districts will generally be zoned to allow most types of land uses, including the construction of buildings and similar structures. To implement this land use zoning, several general provisions are suggested including: establishment of the zoning maps; interpretation of district boundaries; warnings and disclaimers of liability; and applicability of zoning ordinances. (Hoffman-Florida)
W76-06060

COASTAL ZONE MANAGEMENT PROGRAM DEVELOPMENT GRANT.
National Oceanic and Atmospheric Administration, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-06095

6G. Ecologic Impact Of Water Development

SOCIOLOGICAL ANALYSIS OF DAM IMPACT: A STUDY OF TWENTY-TWO LARGE DAMS IN TEXAS,
Texas A and M Univ., College Station. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W76-05501

THE IMPACT OF CANYON DAM AND RESERVOIR ON WILDLIFE,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
B. W. Cain.
In: 'Reservoir Impact Study,' p. 5.i-5.23, November 1974. 6 tab, 11 ref.

Descriptors: *Reservoirs, *Wildlife, Texas, Birds, Mammals, Reptiles, Fish, Post impoundment, Surveys.
Identifiers: *Canyon Reservoir(Texas), Guadalupe River(Texas).

To determine the impact of Canyon Reservoir, Texas, on the wildlife, a biological survey of the river bottom above and below the impoundment indicated that the reservoir and the accompanying land-use changes reduced the bird population from 53 to 31 species; the higher number was observed in the adjacent recreational parks. White-tail deer were numerous in the ranch lands surrounding the reservoir, parks, and residential areas but their numbers around the reservoir were reduced. Most of the small fur-bearing mammals identified are nocturnal and thus are less affected by human activity. The poisonous snakes will probably be reduced as people are quick to kill them. The toads and frogs may prosper with reduced predation. The reservoir apparently affects the distribution and abundance of fish species. The rainbow trout has been introduced and their survival and reproduction have good prognosis. Bass, crappie, and catfish have apparently suffered no ill effects, but fish species that require moving water were affected. The group of animals least affected by the reservoir construction appear to be mammals and the most affected group is fish. All species identified are listed. (See also W76-04501) (Auen-Wisconsin).
W76-05504

ENVIRONMENTAL CONSIDERATIONS IN RIVER BASIN PLANNING AND DECISION MAKING,
Arizona Univ., Tucson, Inst. of Renewable Natural Resources.
For primary bibliographic entry see Field 4A.
W76-05510

PRECIPITATION MANAGEMENT FOR RECLAMATION OF OVERGRAZED AREAS IN ARID AND SEMI-ARID REGIONS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W76-05603

HOW TO GUIDE GROWTH IN SOUTHEASTERN NEW ENGLAND, PARTS I, II AND IV OF THE DRAFT REPORT.
New England River Basins Commission, Boston, Mass. Southeastern New England Study.
Review Draft, May 1975. 294 p, 3 fig, 33 tab, 17 map.

Descriptors: *Planning, *Water supply, *Water quality, *Land use, *Environmental effects, *Regional economics, New England, Massachusetts, River Basin Commissions.
Identifiers: *Environmental impact statement, Boston metropolitan area, Cape Cod(MA), Southeastern New England, *New England River Basins Commission.

This is a public review draft which is subject to change in scope and detail. Its purpose is to identify and recommend actions by government and private interests to secure for the people of the region a balance of conservation and development. It details the natural resource base, including limitations and capabilities, future demands on resources, and a management program. Three key findings: enhancing the environment will enhance the region's economy because it is the environment which attracts service activities which will surpass manufacturing in the region before 1990; anticipated growth can be accommodated but must be guided to be efficient; and existing local and state institutions are capable of guiding growth. Numerous recommendations are made concerning several areas: guiding growth, water supply, water quality, outdoor recreation, marine management, flooding, unwelcome facilities, and resource protection. Recommendations are ranked into 4 categories. Emphasis is on striking a balance between growth and protection of the environment, and on achievable goals. In water supply the goal is to meet municipal needs for adequate supplies of fresh water in the most economically feasible and environmentally sound manner. With regard to unwelcome facilities the objective is to provide such vital services as power, fuel, construction materials and solid waste disposal in a manner which supports economic growth but which minimizes environmental impacts. Recommendations are varied to respond to individual

needs; they include planning proposals, management programs, construction projects, surveys, tax proposals, licensing schemes, information dissemination, and zoning proposals. (Smith-North Carolina)
W76-05649

HANLON CREEK ECOLOGICAL STUDY, PHASE B.
Guelph Univ. (Ontario). Centre for Resources Development.
Volume 1. April 1972. 71 p, 1 fig, 12 maps, 1 tab.

Descriptors: *Watershed management, *River basin development, *Urbanization, *Recreation, *Land use, Groundwater, Water table, *Ecology, Planning, Environment , Habitates, City planning, Runoff, Wildlife conservation, Storm drains, Storm runoff, *Canada.
Identifiers: *Hanlon Creek(Ontario-Canada), City of Guelph(Ontario), Open space.

This study depicts the terrestrial and aquatic environment of Hanlon Creek and its watershed near the City of Guelph, Ontario. It was undertaken to aid planning and to insure that future options are not closed off prematurely. While this watershed is of high quality, neither prohibiting urban development nor allowing total urbanization is justified. Recommendations are made concerning municipal development and change: storm drainage systems, sediment control, roof drainage, toxic substances; stream biology considerations; maintain the watertable, preserve wooded areas, reforest slopes; terrestrial wildlife and vegetation; landscape quality control including woodlands, institutional, commercial, residential uses; and social concerns which involve open space, recreation centers, bicycle paths, youth centers and outdoor entertainment. Analysis of data collected through a year of study is given with maps which show many environmental considerations. These include water table depths, depth of organic matter, slope, limitations of urban development, underground utilities, susceptibility to erosion, recreation areas, and location of lagoons for renovation of storm sewer waters. The maps are drawn at small scale. Exact conditions of a site must be determined by survey. The study concludes with alternative development policies which are aimed at working with natural systems. The policies can take either a conservation emphasis, a recreation emphasis or a development emphasis. Each has advantages and disadvantages in terms of environmental quality, cost, access, etc. No final decision can yet be made but this study is a beginning to appropriate planning for the watershed area. (Smith - North Carolina)
W76-05650

STRUCTURING COMMUNICATIONS PROGRAMS FOR PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6B.
W76-05652

A STUDY OF PROSPECTIVE WATER POLLUTION CONTROL ACTIVITIES FOR THE OHIO RIVER VALLEY WATER SANITATION COMMISSION (ORSANCO),
Wendell Associates, McLean, Va.
For primary bibliographic entry see Field 5G.
W76-05654

MANAGEMENT OF ENVIRONMENTAL QUALITY: OBSERVATIONS ON RECENT EXPERIENCE IN THE UNITED STATES AND THE UNITED KINGDOM,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 5G.
W76-05659

LAKE AND SHORE ICE CONDITIONS ON SOUTHEASTERN LAKE MICHIGAN IN THE VICINITY OF THE DONALD C. COOK NUCLEAR PLANT: WINTER 1973-74,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2C.
W76-05664

MEASURING AND MINIMIZING THE SOCIAL COST OF ENVIRONMENTAL POLLUTION,
Tennessee Univ., Knoxville. Center for Business and Economic Research.
For primary bibliographic entry see Field 5G.
W76-05824

A TECHNIQUE FOR ENVIRONMENTAL DECISION MAKING USING QUANTIFIED SOCIAL AND AESTHETIC VALUES,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5G.
W76-05825

WILLINGNESS TO PAY AS A BEHAVIOURIAL CRITERION FOR ENVIRONMENTAL DECISION-MAKING,
Waterloo Univ. (Ontario). Dept. of Man-Environment Studies.
For primary bibliographic entry see Field 5G.
W76-05826

ENVIRONMENTAL IMPACT ASSESSMENT AS AN INSTRUMENT OF PUBLIC POLICY FOR CONTROLLING ECONOMIC GROWTH,
Waterloo Univ. (Ontario). Dept. of Man-Environment Studies.
D. W. Fischer.
International Journal of Environmental Studies, Vol. 6, No. 4, p. 233-242, 1974. 43 ref.

Descriptors: *Decision making, *Project planning, *Economic impact, *Environmental effects, Evaluation, Effects, Project purposes, Federal project policy, Benefits, Costs.
Identifiers: *Economic growth, Environmental impact assessment.

A complete environmental impact assessment system should consist of identification of planned and induced economic activities and affected environmental elements; an evaluation of initial and subsequent impacts; and, management of beneficial or adverse environmental impacts generated by both planned and induced activities over time. The results of a required assessment system would have considerable consequences for economic growth. As a control instrument it will, no doubt, dampen the economic growth rate by modifying, or curtailing altogether, projects on which growth depends. The main thrust of environmental assessment as a control instrument is its wide applicability to all impacts of economic activities, public and private, and to the impacts of all economic materials, whether the materials are inputs, outputs, or wastes. In this wide role, environmental assessment provides an umbrella for complementary control instruments such as regulations, standards, subsidies, taxes and effluent charges, prohibitions, and appropriations. Assessment provides an information base for possible employment of other control measures to help mitigate the impact of growth activities. For example, should an assessment reveal an adverse impact such as pollutant emissions, an effluent charge could be set to reduce or eliminate them. Two disadvantages associated with environmental assessment include reduction in investment and innovation, and difficulty in achieving an optimum. (Slattery-Wisconsin).
W76-05828

RELATION OF WATER LEVEL AND FISH AVAILABILITY TO WOOD STORK REPRODUCTION IN THE SOUTHERN EVERGLADES, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2I.
W76-05850

RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION ANNUAL REPORT - ECOLOGY, JANUARY-DECEMBER 1974.
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05879

SOUTH DAKOTA ENVIRONMENTAL POLICY ACT.
For primary bibliographic entry see Field 5G.
W76-06075

7. RESOURCES DATA

7A. Network Design

RIVER BASIN MODELS AND THEIR APPLICATION WITH SCARCITY OF DATA.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 4A.
W76-05516

CORRECTION OF BIAS IN THE ESTIMATION OF THE COEFFICIENT OF SKEWNESS,
Institut National de la Recherche Scientifique, Rimouski (Quebec).
For primary bibliographic entry see Field 2E.
W76-05910

PUMPING-TEST ANALYSIS USING A DISCRETE TIME-DISCRETE SPACE NUMERICAL METHOD,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-05913

7B. Data Acquisition

LINE MOTION AND WATER CURRENT DISSENSOR,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
M. L. Greene, and G. J. Moss.
U. S. Patent No. 3,929,015, 3 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office Vol 941, No 5, p 2040, December 30, 1975.

Descriptors: *Patents, *Currents(Water), *Current meters, *Instrumentation, Flow Velocity, Monitoring, Ocean currents.
Identifiers: Mooring lines, Cable strum.

The device may be secured in the water for determining current flow or frequency and amplitude of strumming mooring lines. The device includes an aluminum tubular member having parallel electrical lines extending along the length of an inside of the tubular member. A ring type magnetic follower on the inside of the tubular member having a slide wire in contact with the parallel wires follows a magnetic ring on the outside of and surrounding the tubular member and operates as a potentiometer. The magnetic ring is mounted on a neutrally buoyant slidable disc which is operative between two opposing stainless steel nonmagnetic springs. Current flow or a force against the disc moves the disc along the length of the tubular member against one of the springs. The magnetic follower follows the disc thereby shortening or lengthening the

fective resistance length of the wires within the tubular member. The resistance wires are connected electrically with a recorder or other instruments to indicate the movement of the disc. The displacement of the disc is proportional to the square of the velocity component in the direction of movement. (Sinha - OEIS)
W76-05539

FLOWMETER FOR AN OPEN AQUEDUCT,
Yamatake-Honeywell Co., Ltd., Tokyo (Japan). (Assignee).
K. Takeuchi, and R. Matsumoto.
U. S. Patent No. 3,929,016, 3 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2041, December 30, 1975.

Descriptors: *Patents, Channels, *Open channels, *Water conveyance, *Flow measurement, *Flowmeters, Water measurement, Flow control, Gates.
Identifiers: *Electromagnetic flowmeters.

A flowmeter arrangement measures the flow rate of water flowing in an open aqueduct. A dam gate is positioned to be raised or lowered into a sump portion of the aqueduct. The sump has a fluid depth greater than the aqueduct. The lower central portion of the gate carries an electromagnetic flowmeter transducer. When the dam gate, carrying the electromagnetic flow transducer, is lowered to operating position, the flow of water is blocked by the gate. The depth of the sump is such that so long as there is fluid flowing in the aqueduct, the sump will be full and the electromagnetic transducer will be submerged to a depth were the bore of the transducer will be completely filled. With the transducer thus submerged in the sump, all of the fluid flowing in the aqueduct flows through the transducer where the flow rate is sensed, and a corresponding signal transmitted to the supporting electronic circuitry. (Sinha - OEIS)
W76-05540

COMPARATIVE EFFECTIVENESS OF THE STANDARD SURBER SAMPLER AND A HYDRAULIC MODIFICATION FOR ESTIMATING BOTTOM FAUNA POPULATIONS,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
W. R. Meehan, and S. T. Elliott.
The Progressive Fish-Culturist, Vol 36, No 1, p 17-19, January, 1974. 1 tab, 10 ref.

Descriptors: *Benthic fauna, *Bottom sampling, Reliability, Variability, Streams, *Alaska, Sampling, Analytical techniques.
Identifiers: Surber samplers.

The effectiveness of a hydraulic modification of the Surber sampler for assessing benthic fauna was evaluated by comparing it with the standard Surber sampler. Sampling was done in two streams in southeast Alaska by taking a sample with the hydraulic unit adjacent to one taken with the standard Surber. Several of these paired samples were taken from different stream bottom types. Analyses failed to show any significant differences between the two techniques in numbers, weight, or species composition of the bottom fauna obtained. (Forest Service).
W76-05613

THE APPLICATION OF SEQUENTIAL ESTIMATION METHODS TO COUNTS OF PHYTOPLANKTON,
Comitato Nazionale per l'Energie Nucleare, Rome (Italy). Technological Lab.
For primary bibliographic entry see Field 5A.
W76-05622

DESIGN AND RESULTS OF COMPARATIVE TESTS OF A RAINFALL RECORDER OPERATING FOR A WEEK (WRR),
N. A. Zykov.
Soviet Hydrology, Selected Papers, No. 6, p 500-503, 1973. 1 fig, 3 tab. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 207, p 127-131, 1973.

Descriptors: *Rain gages, *Rainfall, *Instrumentation, *Measurement, Rainfall intensity, Rain, Precipitation(Atmospheric), Rates, Meteorology.
Identifiers: *USSR.

Detailed coverage of large unpopulated areas with observations by precipitation gages and pluviographs is difficult and there are no Soviet rain recorders that operate automatically for a long time. Therefore it is very important to develop an instrument for measuring rainfall depth and intensity that would operate automatically for a long period. The design of such an instrument (WRR) was developed and tested in the experimental areas of the Valdai Hydrologic Scientific Research Laboratory in 1971. The design of the WRR instrument and comparison tests of its readings with those of a standard instrument were described. The results of the comparative tests lead to the conclusion that the WRR measures the amount of precipitation during the warm period somewhat more accurately than the precipitation gage and the rainfall totalizer. The rainfall intensity recording accuracy of this instrument is 0.01 mm/min lower than that of the pluviograph. (Sims-ISWS)
W76-05674

A SPECTRAL LIGHT ABSORPTION METER FOR MEASUREMENTS IN THE SEA,
Copenhagen Univ., Denmark. Inst. of Physical Oceanography.
N. Hojerslev.
Limnology and Oceanography, Vol. 20, No. 6, p 1024-1034, November 1975. 10 fig, 4 tab, 19 ref.

Descriptors: *Optical properties, *Light intensity, *Instrumentation, *Analytical techniques, Light, Opacity, Light penetration, Reflectance, Aquatic environment, Physical properties, Absorption, Measurement, Sea water, Testing procedures, On-site tests, Water measurement, Oceans.
Identifiers: *Light absorption meter, Irradiance, *Denmark, *Spectral absorption meters, Absorption coefficients, Light scattering, Light transmission, Vector irradiance, Scalar irradiance, Fluorescence, Chemical energy, Fluorescent light, Absorption meter.

The light absorption coefficient of a medium such as seawater is an inherent optical property that can be determined in absolute values by means of the uncalibrated in situ light absorption meter described here. The method was based on the assumptions that the optical conditions remain steady within the measuring period, that the horizontal divergence of the vector equals zero, and that the natural fluorescent light energy within the visible part of the spectrum can be ignored. The light absorption meter measures simultaneously the sum and the difference of the scalar and vector irradiance. (Henley-ISWS)
W76-05680

ON RADAR-RAINGAGE COMPARISON,
Quebec Univ., Montreal. Dept. of Physics.
For primary bibliographic entry see Field 2B.
W76-05694

AN ASSESSMENT OF AUTOMATIC SEWER FLOW SAMPLERS - 1975,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W76-05864

SEWER FLOW MEASUREMENT - A STATE-OF-THE-ART ASSESSMENT,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W76-05865

COMPILATION OF METHODOLOGY USED FOR MEASURING POLLUTION PARAMETERS OF SANITARY LANDFILL LEACHATE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-05869

DEVELOPMENTS IN UNDERWATER RADIOTELEMETRY AND PRELIMINARY FISH TRACKING IN THERMAL PLUMES,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05893

CHARACTERISTICS OF TEMPERATURE-SENSITIVE FISH TAGS USED IN 1974,
Argonne National Lab., Argonne, Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W76-05897

NUCLEAR TECHNIQUES IN HYDROLOGY--CURRENT STATUS AND PROSPECTIVE USES.
National Academy of Sciences, Washington, D.C.; National Committee for the International Hydrological Decade, Washington, D.C.
For primary bibliographic entry see Field 5A.
W76-05922

ESTIMATE OF THE RATE OF TURBULENT MIXING OF THE FLUID IN WIND-DRIVEN CURRENTS FROM THE RESULTS OF MOVING AND STILL PARTICLE PHOTOGRAPHY,
For primary bibliographic entry see Field 8B.
W76-05932

PORTABLE WATER SAMPLING APPARATUS,
Universal Oil Products Co., Des Plaines, Ill. (Assignee).
J. L. Mogg, and R. E. Paulson.
U.S. Patent No. 3,930,754, 3 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 942, No 1, p 353, January 6, 1976.

Descriptors: *Patents, *Water sampling, *Water wells, *Observation wells, *Aquifer testing, Drawdown, Samplers, Water pollution, Equipment, Pollutant identification.
Identifiers: Portable equipment.

Portable, self powered water pumping apparatus for use in sampling water in remotely located wells comprises a wheeled hose reel cart which supports a long length of plastic hose or tubing. The tubing has a small diameter length of inner tubing telescoped inside itself throughout most of its length. The inner tubing passes through the wall of the outer tubing near the upper end and is connected to a pressurized cylinder of gas such as a standard 14 oz. propane gas cylinder. When the lower ends of the tubes are well submerged beneath the water level in a well, admission of gas to the inner tube at its upper end will force water up through an annular space between the tubes and out the upper end of the outer tube where it can be collected. A channeled plug at the bottom of the tubes prevents the tubes from collapsing, helps to keep them straight and together as they are lowered into the well and provides partial support for a weight hanging from the bottom of the tubes. (Sinha-OEIS)
W76-05958

WATER LEVEL GAUGE,
Department of the Navy, Washington, D.C. Office of the Secretary.
N. H. Rector, and R. G. Fredericks.
U.S. Patent No. 3,933,042, 3 p, 8 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 942, No 3, p 1149, January 20, 1976.

Descriptors: *Patents, *Water levels, *Water level fluctuations, *Water level recorders, *Instrumentation, Bodies of water, Height, Tidal effects.
Identifiers: Stilling wells.

A water level gauge is described which is used to determine the average level of water in a body of water such as rivers, lakes and oceans under varying ambient conditions. The liquid level gauge includes a stilling well, a pipe tower for retaining the stilling well at a fixed position in relationship to the water level to be measured, a capacitance probe inside the stilling well, means for admitting liquid into the stilling well at a predetermined rate and electronic circuitry for placing a signal on the probe. The probe consists of a probe which has a dielectric coating and a second probe retained in a predetermined spaced position from the first. An electric signal applied to the probes is measured to relate the change in capcitance between the first and second probes depending upon the amount of liquid in the stilling well. (Sinha-OEIS)
W76-05977

APPLICATION OF INFRARED SPECTROSCOPY TO ERODIBILITY STUDIES OF THE SOIL,
Allahabad Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 2J.
W76-06140

7C. Evaluation, Processing and Publication

RESERVOIR MANAGEMENT VIA RELIABILITY PROGRAMMING,
Politecnico di Milano (Italy). Istituto di Elettrotecnica ed Elettronica.
For primary bibliographic entry see Field 4A.
W76-05508

THE OUT-OF-KILTER ALGORITHM AND SOME OF ITS APPLICATIONS IN WATER RESOURCES,
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W76-05515

RIVER BASIN MODELS AND THEIR APPLICATION WITH SCARCITY OF DATA.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 4A.
W76-05516

CAREFUL SAMPLE TAKING IS KEY TO SUCCESSFUL WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 4B.
W76-05560

A DRILLER'S GOOD FRIEND - THE ELECTRIC LOGGER,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8G.
W76-05561

QUURM - A REALISTIC URBAN RUNOFF MODEL,
Queen's Univ., Kingston (Ontario).
For primary bibliographic entry see Field 2A.
W76-05577

FLOOD HAZARD ANALYSES: BUFFALO RIVER, AMHERST COUNTY, VIRGINIA.
Soil Conservation Service, Richmond, Va.
For primary bibliographic entry see Field 4A.
W76-05643

FLOOD HAZARD ANALYSES: BLACKS RUN-COOKS CREEK, ROCKINGHAM COUNTY AND HARRISONBURG, VIRGINIA.
Soil Conservation Service, Richmond, Va.
For primary bibliographic entry see Field 4A.
W76-05644

FLOOD PLAIN INFORMATION: ILLINOIS AND MICHIGAN CANAL, ROCK RUN CREEK, THORNE CREEK, JOLIET, ILLINOIS.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-05645

SPECIAL FLOOD HAZARD INFORMATION REPORT: HOWELL CREEK BASIN LAKES, ORANGE COUNTY, FLORIDA,
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W76-05646

FLOOD PLAIN INFORMATION: LITTLE MCMULLEN CREEK, JESUP, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-05648

FORECASTING WATER LEVELS IN AQUIFERS BY NUMERICAL AND SEMIHYBRID METHODS,
Technion-Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W76-05686

DETERMINING AQUIFER COEFFICIENTS FROM RESIDUAL DRAWDOWN DATA,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2F.
W76-05689

TREND ANALYSIS OF ANNUAL INDIAN RAINFALL,
Institute of Tropical Meteorology, Poona (India).
For primary bibliographic entry see Field 2B.
W76-05691

CONTINUOUS SEASONAL PROBABILITY OF EXTREME RAINFALL EVENTS,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 2B.
W76-05692

STATISTICS OF RAINGAGE DATA,
McGill Univ., Montreal (Quebec). Dept. of Physics.
For primary bibliographic entry see Field 2B.
W76-05693

DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Texas Univ. at Austin. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W76-05745

TORONTO'S APPROACH TO PREVENTIVE MAINTENANCE FOR TREATMENT PLANTS,
Metropolitan Toronto Dept. of Works (Ontario). Water Pollution Control Div.
For primary bibliographic entry see Field 5F.
W76-05780

SOCIAL SCIENCE DATA BANKS AND THE INSTITUTE FOR WATER RESOURCES,
American Univ., Washington, D.C.
For primary bibliographic entry see Field 6B.
W76-05822

MODELING THE EFFECT OF WASTE DISCHARGES IN A SMALL MOUNTAIN STREAM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05834

VERTICAL ELECTRICAL RESISTIVITY SOUNDINGS TO LOCATE GROUND WATER RESOURCES: A FEASIBILITY STUDY,
Old Dominion Univ., Norfolk, Va. Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 4B.
W76-05835

SELECTED WATER-QUALITY DATA FROM FALLEN LEAF LAKE, EL DORADO COUNTY, CALIFORNIA, JUNE THROUGH OCTOBER 1974,
Geological Survey, Menlo Park, Calif.
R. H. Fuller.
Open-file report, November 1975. 38 p, 2 fig, 5 tab, 4 ref.

Descriptors: *Water quality, *Baseline studies, *Environmental effects, *Alpine, *Lakes, Streams, *California, Sampling, Water analysis, Chemical properties, Biological properties, Physical properties, Limnology, Inflow, *Basic data collections.
Identifiers: *Fallen Leaf Lake(Calif), El Dorado County(Calif).

In 1974 the U.S. Geological Survey entered into a cooperative agreement with the California Department of Water Resources to study the limnology of Fallen Leaf Lake and adjacent streams. The lake is in El Dorado County, California, near the crest of the Sierra Nevada about 23 miles southwest of Reno, Nevada. The study was undertaken to help develop a better understanding of selected characteristics of a high-altitude dilute solution lake-stream system and the effect of man on the system. Fallen Leaf Lake and the adjacent streams were chosen because the lake represents an alpine system in a basin that has had limited development for a number of years. Water samples were collected and field measurements were made regularly at two stations in Fallen Leaf Lake, one station in Glen Alpine Creek, one in Cathedral Creek, and at two stations in Taylor Creek. Physical, chemical and biological data are tabulated. (Woodard-USGS)
W76-05848

A DIGITAL-COMPUTER MODEL FOR ESTIMATING HYDROLOGIC CHANGES IN THE AQUIFER SYSTEM IN DANE COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 2F.
W76-05851

LIMNOLOGICAL DATA FOR THE MAJOR STREAMS IN CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
B. W. Lium.
Open-file report, January 1976. 219 p, 1 fig, 3 tab.

Descriptors: *Baseline studies, *Water quality, *Streams, *Pennsylvania, *Urbanization, Basic data collections, Water analysis, Chemical properties, Biological properties, Physical properties.
Identifiers: *Chester County(Pa).

Limnological data on major streams in Chester County, Pa., are tabulated to provide a base line as to the present stream conditions. As land-use patterns change and further urbanization takes place, it is anticipated that these data will serve as a basis for comparison of conditions in the future. The 13 basins encompass a total drainage area of 697 sq mi of the 760 sq mi within Chester County. Four of the streams are tributaries to the Schuylkill River and include Pickering, Stony Run, Pigeon, and French Creek. Tributaries to the Delaware River include Darby, Crum, Ridley, Chester, Red Clay, and White Clay Creeks. The Elk Creeks flow into the Chesapeake Bay. The Brandywine is a tributary to the Christiana River, itself a tributary to the Delaware. The Octoraro Creek is a tributary to the Susquehanna River. Chester County, which is located in the Piedmont area of Pennsylvania, is undergoing rapid transition from a rural to a suburban population. Chemical, physical, and biological data were collected at 50 sites from fall 1969 through fall 1974. (Woodard-USGS)
W76-05852

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF EASTERN MONTANA, 1975-76,
Geological Survey, Helena, Mont.
Open-file report, January 1976. 29 p, 10 fig.

Descriptors: *Basic data collections, *Water resources development, *Water quality, *Montana, *Coal mines, Hydrologic data, Groundwater, Surface waters, Water yield, Aquifers, Water supply, Sediment transport.

This report presents the water data-collection program and interpretive hydrologic investigations that are being conducted by the U.S. Geological Survey in the Northern Great Plains region of eastern Montana. The area is of intense interest for coal companies, utilities, State and Federal agencies, universities, private citizens, landowners, and environmental groups. In October 1975 there were 45 streamflow and 64 water-quality data-collection stations in the region for collection of streamflow, chemical-quality, sediment, and temperature data. These stations are located on all types of streams from the mainstem Yellowstone and Missouri Rivers to small ephemeral and intermittent streams that drain proposed mine areas. Groundwater investigations are being conducted to determine the areal hydrology of the Madison Group and associated Paleozoic rocks and the areal and site hydrology of shallow aquifers in the Fort Union Formation, including the coal beds. Available data, mostly from oil tests, indicate that the Madison may yield water suitable for use in energy development in the Northern Great Plains coal region. Fieldwork in the shallow groundwater study consists principally of an inventory of wells and springs and construction of wells for water sampling, aquifer testing, and water-level measurements. A computer model is being constructed to determine the effect on stream temperature of selected increases in withdrawal rates, and thus reduced flow, of the Yellowstone River from Billings to Sidney, Mont. (Woodard-USGS)
W76-05853

STEADY-STATE SEGMENTED DISSOLVED-OXYGEN MODEL,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 5B.
W76-05855

EVALUATION OF DATA AVAILABILITY AND EXAMPLES OF MODELING FOR GROUND-WATER MANAGEMENT ON CAPE COD, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 4B.
W76-05856

TABLE OF DATA ON WATER QUALITY OF BAKER LAKE NEAR MOUNT BAKER, WASHINGTON,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, and R. T. Wilson.
Open-file report 76-195, February 1976. 12 p, 2 fig, 1 tab, 3 ref.

Descriptors: *Water quality, *Reservoirs, *Volcanoes, *Gases, *Washington, Environmental effects, Data collections, Water analysis, Specific conductivity, Hydrogen ion concentration, Water temperature, Dissolved oxygen.
Identifiers: *Baker Lake(Wash), *Mount Baker(Wash).

On March 10, 1975, volcanic activity on Mount Baker, Wash., increased dramatically in the form of new or greater emanations of heat, steam and other gases, and ash from a known fumarole field in Sherman Crater. The greater heat increased subglacial melting and subsidence of ice in the center of the crater. Flow of acid-rich waters into Boulder Creek apparently increased also. Boulder Creek discharges into Baker Lake, which is a reservoir used primarily for power generation but also for recreation, sport fishery, and salmon migration. This apparent increase in acidity of Boulder Creek water has raised questions about possible detrimental effects on Baker Lake. A preliminary survey was made in September 1975 by the U.S. Geological Survey to measure various water-quality characteristics in Baker Lake near the inflow of Boulder Creek. Data are tabulated from six transects on Baker Lake trending approximately perpendicular to Boulder Creek channels (or plumes of Boulder Creek water in the lake) and roughly along bottom contours, and one transect about 1.1 miles downlake from the southermost channel of Boulder Creek. On September 3, the first day of the lake survey, water at the mouth of Boulder Creek had a temperature of 10.0 deg C, specific conductance of 262 micromhos, and pH of 3.8. The estimated discharge from Boulder Creek was 75 cfs. (Woodard-USGS)
W76-05857

HYDROGEOCHEMICAL DATA FROM INVESTIGATION OF WATER QUALITY IN SEWERED AND UNSEWERED AREAS, SOUTHERN NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
N. M. Perlmutter, and E. Koch.
Long Island Water Resources Bulletin LIWR-4, 1975. 37 p, 2 fig, 1 plate, 4 tab, 7 ref.

Descriptors: *Water quality, *Chemical analysis, *Basic data collections, *Water analysis, *New York, Environmental effects, Sewage, Septic tanks, Cesspools, Sewerage, Pipelines, Sewage disposal, Surface waters, Water pollution sources, Pollutant identification.
Identifiers: *Long Island(NY).

About 1,000 chemical analyses of groundwater and surface-water samples collected from 1948 to 1972 in a 180 sq mi area of southern Nassau County, N.Y., are tabulated. The analyses are useful in planning and studying the development of water resources in the county. The data represent water samples from groundwater-fed streams and confined and unconfined unconsolidated aquifers composed of gravel, sand, silt, and clay of Pleistocene and Late Cretaceous age. The analyses also represent one of the few modern regional compilations of hydrogeochemical data that show a side-by-side comparison of water quality before and after replacement of several hundred thousand cesspools by public sewers. The sewered part of the study area consists of Nassau County Sewer District 2 and the village of Freeport. The presently (1972) unsewered part of the study area consists of Nassau County Sewer District 3, where sewer construction, now in progress, is scheduled for completion in 1983. Public water-supply systems, which serve most of the population, draw water mainly from the Magothy aquifer and to a small extent from the Lloyd and the upper glacial aquifers. In 1970, water from public-supply wells in the study area was pumped at a rate of about 140 mgd. No surface water is used for public supply in the county. (Woodard-USGS)
W76-05858

FLORIDAN AQUIFER IN NORTHEAST FLORIDA--THREE MAPS--HARDNESS OF WATER, CHLORIDE CONCENTRATION, AND POTENTIOMETRIC SURFACE, MAY 1974,
Geological Survey, Tallahassee, Fla.
G. W. Leve.
Open-file report FL 75003, 1975. 3 sheets, 3 maps.

Descriptors: *Aquifer characteristics, *Florida, *Maps, *Groundwater, Hydrologic data, *Chlorides, *Hardness(Water), Water levels, Contours, Mapping.
Identifiers: Floridan aquifer, Northeast Florida.

Lines on 3 separate maps of the Floridan aquifer in northeast Florida show equal intervals for (1) chloride concentration, (2) water hardness, and (3) potentiometric data. (Woodard-USGS)
W76-05859

THE 1973 MISSISSIPPI RIVER BASIN FLOOD: COMPILATION AND ANALYSES OF METEOROLOGIC, STREAMFLOW, AND SEDIMENT DATA,
National Weather Service, Silver Spring, Md.; and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W76-05860

AVAILABILITY OF GROUND WATER IN THE ANDROSCOGGIN RIVER BASIN, NORTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N.H.
J. E. Cotton.
Water-Resources Investigations 22-75, 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Groundwater resources, *Water quality, *Available water, *New Hampshire, River basins, Hydrologic data, Maps, Water wells, Aquifers, Aquifer characteristics.
Identifiers: *Androscoggin River basin(NH).

This report provides a guide for groundwater exploration and for water- and land-use planning and management in the Androscoggin River basin in northern New Hampshire. Sufficient amounts of water to supply single family homes is available from the bedrock aquifer nearly everywhere in the basin. Relatively thin and narrow, unconsolidated aquifers of sand or sand and gravel capable of sustaining the moderate and high yields generally required by industries and municipalities are found only in major stream valleys. The map provides a preliminary assessment of the availability of groundwater, as determined by estimating the capability of the aquifers to store and transmit water. On the map, aquifers are rated as having high, medium, or low potential to yield water. The groundwater is generally of good chemical quality. Most of it is clear and colorless, contains no suspended matter and practically no bacteria, and is low in dissolved-solids concentration. Also, it is generally soft (0-60mg/litre of hardness) or moderately hard (61-120 mg/litre). Several water-quality problems may occur within the basin. Iron and manganese may occur in concentrations greater than the limits for drinking water, 0.3 and 0.05 mg/litre respectively, recomended by the U.S. Public Health Service (1962). (Woodard-USGS)
W76-05862

COMMENT UPON MULTIVARIATE SYNTHETIC HYDROLOGY,
Centro di Ricerca IBM di Pisa (Italy).
For primary bibliographic entry see Field 2A.
W76-05909

PUMPING-TEST ANALYSIS USING A DISCRETE TIME-DISCRETE SPACE NUMERICAL METHOD,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W76-05913

FINITE ELEMENT MESH GRADATION FOR SURFACE WAVES,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 8E.
W76-05919

GEOLOGY AND WATER RESOURCES OF CHARLES MIX AND DOUGLAS COUNTIES, SOUTH DAKOTA, PART I: GEOLOGY,
Geological Survey, Vermillion, S. D.
For primary bibliographic entry see Field 4A.
W76-05923

POSSIBILITY OF DETERMINING THE AREAS OF HEAVY PRECIPITATION BY DISCRETE REPRESENTATION OF RADAR DATA,
For primary bibliographic entry see Field 2B.
W76-05933

MAPS OF THE ELEMENTS OF THE HYDROLOGIC BUDGET OF ASIA,
Akademiya Nauk SSSR, Moscow. Institut Gregrafii.
For primary bibliographic entry see Field 2A.
W76-05934

PESTICIDE RESIDUE DYNAMICS IN A FOREST ECOSYSTEM: A COMPARTMENT MODEL,
Forest Service (USDA), Corvallis, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 5B.
W76-05946

8. ENGINEERING WORKS

8A. Structures

UNDERWATER WALL STRUCTURE,
R. N. Hebel, Jr.
U. S. Patent No. 3,927,533, 4 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1572, December 23, 1975.

Descriptors: *Patents, *Shore protection, *Beach erosion, *Coastal structures, Littoral, Underwater, Piles(Foundations), *Erosion control, Sediment control, Sediment discharge.
Identifiers: Underwater walls.

A permanent underwater wall structure is provided along a shoreline characterized by an offshore bar and a longshore trough which is indicative of the fact that the erosion process has begun. The invention is applicable to shore contours in which the offshore bar is no more than 150 feet from the normal shoreline at mean low tide. The permanent underwater wall structure comprises individual pilings driven in side-by-side relation to the ocean floor consisting of three sections. These are, two end sections which extend in spaced-apart relation from the vicinity of the shoreline, some 150 feet to the offshore bar and a middle section extending generally along the offshore bar and connecting the two end sections. The individual pilings are driven to such a depth that all except the pilings adjacent to the shoreline are below the water level at mean low tide and generally are in a horizontal plane with the top of the offshore bar. For this reason, the flow of water toward the beach is unimpeded while the offshore and littoral currents carrying suspended material away are impeded thus allowing deposition of suspended material within the protected areas. Interlocking tongue and groove and guiding joints are provided for locking and guiding the individual pilings so as to form a unitary contiguous structure. (Sinha-OEIS)
W76-05523

APPARATUS AND METHOD FOR EXTRACTING WAVE ENERGY,
For primary bibliographic entry see Field 8C.
W76-05538

CAREFUL SAMPLE TAKING IS KEY TO SUCCESSFUL WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 4B.
W76-05560

USE OF FORMATION STABILIZER - A VALUABLE TECHNIQUE,
Universal Oil Products, St. Paul, Minn. Johnson Div.
R. L. Schreurs.
The Johnson Driller's Journal, Vol. 47, No. 4, p. 6-8, July-August 1975, 4 fig.

Descriptors: *Stabilization, *Water wells, Geologic formation, Well filters, Construction materials, Design.
Identifiers: *Naturally developed wells, *Artificially gravel-packed wells, *Formation stabilized wells.

The principles and applications of formation stabilizers are reviewed beginning with a brief description of naturally-developed and artificially gravel-packed wells. Each of these methods is discussed in relation to design, construction and development. The definition, function and benefits of formation stabilized wells are outlined. (Heiss-NWWA)
W76-05564

ERDA'S TIGER LAGOON PROGRAM TO PROBE NEW ENERGY SOURCE.
Drilling - DCW, Vol. 37, No. 4, p. 27, February 1976.

Descriptors: *Geothermal studies, *Energy conversion, *Electrical power production, Thermal power plants, *Louisiana, Oil wells, Energy.
Identifiers: *Geopressure, *Geothermal energy, Depleted oil wells, Vermillion Parish(La).

A new geopressure, geothermal energy research program of the Energy Research and Development Administration is described. The initial project is to explore the Tiger Lagoon area of Vermillion Parish, Louisiana for geopressure and geothermal energy sources to produce electricity. The Tiger Lagoon test will utilize an old Coastal States oil well at a depth between 13,000 and 14,000 feet. The project plans to exploit the three basic energy sources of pressure, temperature, and methane. Such energy sources could last as long as 25 years. The program's long range goal is to save six million barrels of fossil fuel imports per day by 1990. (Heiss-NWWA)
W76-05568

EXPERIMENTAL WELL FIELD IS PUT TO MANY USES,
For primary bibliographic entry see Field 8G.
W76-05569

PROPOSAL FOR A TRANS-MEDITERRANEAN AQUEDUCT,
Ottawa Univ. (Ontario).
For primary bibliographic entry see Field 4A.
W76-05660

8B. Hydraulics

FLOWMETER FOR AN OPEN AQUEDUCT,
Yamatake-Honeywell Co., Ltd., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 7B.
W76-05540

AIR ROTARY DRILLING WITH ORGANIC POLYMERS OFFERS MANY BENEFITS,
Universal Oil Products Co., Denver, Colo. Johnson Div.
B. J. Reichmuth.
The Johnson Driller's Journal, Vol. 46, No. 6, p. 1-3, November-December 1974, 1 fig.

Descriptors: *Drilling fluids, *Rotary drilling, Clays, Viscosity, Lubricants, *Polymers, Drilling, Water wells.
Identifiers: *Organic polymers, Revert, *Fluid drilling, Shale swelling, Shale sloughing, *Air rotary drilling.

Two specific field examples of air rotary drilling with the organic polymer revert are presented. The properties and advantages of organic polymers lend themselves to efficient and economic operation of the rotary rig. Pounds of polymer used versus marsh funnel viscosity per second at varied temperatures are computed. (Heiss-NWWA)
W76-05562

COSTS AS A GUIDE TO PRICING,
Sydney Univ. (Australia). Dept. of Accounting.
For primary bibliographic entry see Field 6C.
W76-05570

NOMOGRAMS FOR SIMPLIFIED HYDRAULIC DIMENSIONING OF WASTE WATER DUCTS (NOMOGRAMME ZUR VEREINFACHTEN HYDRAULISCHEN BEMESSUNG VON ABWASSER-KANAELEN),
For primary bibliographic entry see Field 5D.
W76-05610

A STABLE NUMERICAL MODEL FOR LOCAL SCOUR,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W76-05666

EQUATIONS FOR RESISTANCE TO FLOW AND SEDIMENT TRANSPORT IN ALLUVIAL CHANNELS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2J.
W76-05844

SEWER FLOW MEASUREMENT - A STATE-OF-THE-ART ASSESSMENT,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W76-05865

IMPACTS OF HYDROLOGIC MODIFICATION ON WATER QUALITY,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 5G.
W76-05866

DISCHARGE EQUATIONS FOR HS, H, AND HL FLUMES,
Agricultural Research Service, Stillwater, Okla., Water Conservation Structures Lab.
W. R. Gwinn, and D. A. Parsons.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY1, Proceedings Paper 11874, p 73-88, January 1976. 11 fig, 3 tab, 3 ref, 2 append.

Descriptors: *Channels, *Flumes, *Stage-discharge relations, *Streamflow, Hydraulic equipment, Hydrology, Runoff, Sediments, Stream gages, Flow, Calibrations, Submergence, Equations, Mathematical models, *Discharge(Water).
Identifiers: HS flumes, H flumes, HL flumes.

Generalized discharge equations for HS and H flumes were developed from the original data. Discharge equations for the HL flume were developed from a published rating table for a 4-ft flume. The equations were expressed in the basic dimensions of the control section. A direct solution for the effect of submergence on H flumes was presented in equation form. (Morris-ISWS)
W76-05918

FINITE ELEMENT MESH GRADATION FOR SURFACE WAVES,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 8E.
W76-05919

CONDITIONAL EXPECTED TSUNAMI INUNDATION FOR HAWAII,
Hawaii Univ., Honolulu.
W. M. Adams.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 101, No. WW4, Proceedings Paper 11702, p 319-329, November 1975. 8 fig, 17 ref.

Descriptors: *Coastal engineering, Environmental effects, *Tsunamis, *Hawaii, Flooding, Floods, Hazards, Shore protection, Waves(Water), Zoning, Statistics, Statistical methods, Seismic waves, Numerical analysis, Islands.
Identifiers: *Peak amplitude, Dominant wavelength, Ray tracing, Tsunami magnitude.

Values were reported for a priori estimates of expected tsunami inundation -- conditioned by values for epicenter location and tsunami magnitude. Those values of conditional expected tsunami inundation (CETI) were restricted to coastal locations having historical observations of tsunamis. Here a method was developed and applied for interpolating between these existing CETI to obtain predictions at coastal locations not possessing historical tsunami data. The method used the existing CETI for calibrating (by best-fitting) the functional shape provided by the output from Bernard's time-stepping linear two-dimensional difference equations over a mesh having spatial increments of about 5 km and time steps of 15 sec (prototype time). Coastal position was measured along the coast from a reference point. Graphs for the interpolated CETI were given for the five major Hawaiian Islands, assuming a tsunami magnitude of 4 arriving from the north. (Lee-ISWS)
W76-05920

WIND EFFECTS ON STREAM FLOWS,
Delaware Univ., Newark. Coll. of Marine Studies; and Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W76-05921

COMPARATIVE ESTIMATE OF ENERGY LOSSES IN BODIES OF WATER, AND QUIET AND TURBULENT FLOWS,
V. A. Znamenskiy.
Soviet Hydrology, Selected Papers, No. 5, p 395-404, 1973. 3 fig, 1 tab, 8 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 203, p 186-199, 1973.

Descriptors: *Energy loss, *Flow, *Turbulent flow, *Laminar flow, Reynolds number, Froude number, Energy dissipation, Energy, Roughness(Hydraulic), Streamflow, Bodies of water, Channel flow, Fluid friction, Fluid mechanics, Hydraulics, *Estimating.
Identifiers: Rapids.

An analysis of experimental and field data showed that the main criterion for separating flows according to the nature of energy losses is the relation associating the slope of the flow, the Reynolds and Froude numbers, and the relative smoothness of the bottom surface. This relation can be expressed analytically for flows where roughness has a static effect (bodies of water and rapids). The dependence on H/delta is less determinate for watercourses, where bottom roughness is determined by mobile channel forms. Under otherwise equal conditions for all flows, a decrease in relative smoothness H/delta corresponds to a decrease of the Re/Fr ratio, testifying to the increasing effect of the Froude number with an increase in roughness or a decrease in flow depth. The analytical relation for hydraulic resistance, obtained for bodies of water, agreed with the deductions of the semi-empirical turbulence theory of L. Prandtl and also with the results of experimental investigations of the kinematic characteristics of the bottom layer. A relation was proposed for flows in bodies of water that makes it possible to determine average velocity in the presence of a water-surface slope, as well as a relation for determining the coefficient of eddy flux for the entire flow. (Sims-ISWS)
W76-05924

ESTIMATE OF THE RATE OF TURBULENT MIXING OF THE FLUID IN WIND-DRIVEN CURRENTS FROM THE RESULTS OF MOVING AND STILL PARTICLE PHOTOGRAPHY,
A. S. Sudol'skiy.
Soviet Hydrology, Selected Papers, No. 2, p 83-90, 1974. 3 fig, 2 tab, 11 ref. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 216, p 25-35, 1974.

Descriptors: *Turbulence, *Mixing, *Waves(Water), *Currents(Water), Winds, Flumes, *Photography, Laboratory tests, Flow, Tracers, *Estimating, Forecasting.
Identifiers: Wind-driven currents, *Turbulent mixing.

Still and moving photographs of zero buoyancy particles in water, taken with exposures equal to or exceeding the period of wind waves by several factors, make it possible to describe the displacement of a fluid in a wind-driven current produced by various kinds of disturbances and structural formations whose dimensions are close to the depth of flow or one order of magnitude larger. Coefficients of turbulent mixing that most fully reflect the actual turbulence of a wind-driven current were obtained by a formula which allows for the pulsations of the longitudinal and vertical components of current velocity. The character of the vertical distribution of the coefficients of turbulent mixing in a wind driven current in the presence of differently directed fluid transport varies as a function of the water depth divided by the average wavelength. The coefficients of turbulent mixing, averaged over the depth of the water, are clearly associated at each given depth with wind speed, wave height, and the velocity of the wind-driven current. The experimental values of the coefficients of turbulent mixing exceed by many factors the computed values, thus indicating that such factors as the different direction of fluid transport and the variations of neighboring waves in a wave system, which cannot be accounted for by theoretical methods, have a considerable effect on the turbulence of a wind-driven current. (Sims - ISWS)
W76-05932

STREAM BED STABILIZATION IN ENFIELD CREEK, NEW YORK,
New York State Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
For primary bibliographic entry see Field 8I
W76-06145

8C. Hydraulic Machinery

WATER CURRENT POWER GENERATOR SYSTEM,
O. R. Straumsnes.
U.S. Patent No. 3,928,771, 3 p, 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 941, No 4, p 1934, December 23, 1975.

Descriptors: *Patents, *Tidal streams, *Tidal energy, *Tidal powerplants, *Energy conversion, Energy transfer, Ocean currents, Ships.
Identifiers: Endless belts, Water wheels.

A water current power generator system is comprised of one or more generator ships firmly anchored to the water bottom to generate power from sea currents or the tidal flow of rivers. The hull of a typical ship includes a shaped inlet where the moving water enters and drives blades hinged to a toothed belt which moves about a pair of rollers. As the blades move about the forward roller, the hinged blades are driven outward to a right angle position to be driven by the water flow. The blades fold into a collapsed position as they pass over the rear roller and move in a direction opposite the water flow thereby minimizing resistance to the water flow. Generally, a pair of toothed belts are provided within each shaped inlet with a thrust member between to direct the water toward the blades. The belts are mounted vertically within the hull to encounter as much of the water pressure as possible. The water then flows out the rear of the hull through a shaped outlet which is smaller than the inlet. in an alternate plan, vertical water wheels with collapsible blades are used instead of toothed belts. This variation would include at least one of such wheels positioned at the inlet and having hinged members serving as blades mounted on the wheels to catch the water flow thereby driving the wheel. The blade would then pivot to an open position minimizing resistance to the motion of the wheel as it moves around the axis of the wheel. (Sinha - OEIS)
W76-05537

APPARATUS AND METHOD FOR EXTRACTING WAVE ENERGY,
S. H. Salter.
U. S. Patent No. 3,928,967, 6 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2024, December 30, 1975.

Descriptors: *Patents, *Energy, *Energy conversion, *Waves(Water), Wavelengths, Bodies of water, Hydraulics, Ocean waves, Hydraulic structures, Pumps, Electric power.

The invention comprises apparatus and method of removing energy by providing wave engaging members so shaped so as to efficiently remove energy from the wave and which pivot about a substantially stationary second portion of the device such that energy is removed from the wave as the first member pivots in either direction relative to the second part. The energy removing pivoted member is shaped such that in cross-section it is generally circular in shape for about 180 deg and which has a wave engaging portion comprising the forward portion of the member which is constructed of tangents extending from the curved rear section. The tangents are joined by a forward nose portion. The device is pivoted near the center

of the rear curved portion which results in little energy transfer between the rear portion of the member and the fluid. A substantial portion of the incident wave energy is extracted from the wave by the forward portion of the member as the member is pivoted about its port. In order to convert the pivotal motion of the wave removing member into useable energy, a pump such as a variable stroke rotary pump having a stator fixed relative to the supporting member and having a rotor which turns with the energy removing member can be provided. The output from the pump may be directly used to generate electricity on the floating supporting structure. (Sinha - OEIS)
W76-05538

WAVE-ACTION POWER APPARATUS,
M. G. Tornabene.
U.S. Patent No. 3,930,168, 8 p, 13 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 941, No 5, p 2369, December 30, 1975.

Descriptors: *Patents, *Energy, *Energy conversion, *Ocean currents, *Ocean waves, *Waves(Water), Electric power, Electric power production, Floats, Pumps, Turbines.

An apparatus is described for a wave-action energy-harnessing float which is responsive to wave action and currents but is durable against the destructive forces of seasonal twisting and turbulent currents and waves. The float is rotatably mounted on a lever mechanism such that the forces of water waves and currents are partially absorbed by the free revolving movement of the float. This allows the lever free reciprocal motion upward and downward within its bearing supports. The float is large enough for increased water-displacement capacity together with a dense mass which maximizes each upward and downward stroke responsive to variations in height of the float between crests and troughs of consecutive waves. A double-action piston-pump has a piston shaft extending coaxially throughout the length of the cylinder for effecting constant and equivalent volume displacement within the cylinder throughout its length irrespective of the location of the piston in to and fro movements. A circular annular flow path for moving water in conduits to and from the pump cylinder to and from turbine provides for continuous flow of water thus avoiding the stopping and starting of intermittant movement due to the waves. An electric generator is connected to the turbine. (Sinha - OEIS)
W76-05549

SIPHON SYSTEM YIELDS CHILEAN PLANT MORE WATER,
Universal Oil Products, St. Paul, Minn. Johnson Div.
J. L. Mogg.
The Johnson Drillers Journal, Vol. 47, No. 5, p 1-3, September-October, 1975, 10 fig.

Descriptors: *Siphon, *Hydraulic structures, Underground storage, Pumps, Water quality, Water yield improvement, Design, Reservoir storage, Water wells, Iron compounds allunium, Pump turbines.
Identifiers: *High yield wells, *Siphon system hydraulics, Stainless steel well points, Calcium bicarbonate deposits, Well redevelopment, Fabrica de Celulosa, Bio Bio River, *Chile.

Engineer Miguel Concha Pinochet, a ground water specialist from Santiago, Chile, conceived and put into successful practice the principle of the siphon to augment his design for producing high yield (27,500 gallons per day) from a series of well points installed in the bed of a shallow river. The well points were all connected to a common header pipe which was connected through a siphon to an on shore, subsurface reservoir. High-capacity, vertical turbine pumps in the subsurface reservoir were installed which moved the water to its points of use within a factory complex. A well field, located on an adjacent river alluvial deposits, failed due to highly mineralized ground water and poor well construction materials. (Heiss-NWWA)
W76-05550

RIG RESTORATION.
For primary bibliographic entry see Field 8G.
W76-05555

COLORADO CITY SOLVES ITS SAND PUMPING PROBLEMS,
Wright Water Engineers, Inc., Denver, Colo.
R. D. Tafelski.
The Johnson Drillers Journal, Vol. 47, No. 2, p 1-3, March-April 1975, 2 fig.

Descriptors: *Particle size, *Well screens, Well casings, Gravels, Aquifers, Colorado, Pumping, Water wells, *Pump testing.
Identifiers: Ogallala formation(Colo), Production rate decrease, Fine grain material, Excessive pump wear, Annulus structure, Pumping schedule, Burlington(Colo), *Sand pumping.

The City of Burlington, Colorado experienced problems with sand pumping and a consequent decrease in production rates of its seven municipal waterwells. Excessive water meter wear and primary water line blockage by sand were the serious problems. The fine-grained material in the Ogallala formation plus coarse angular gravel pack and slotted pipe were the prime cause of the difficulty. The situation reached its most serious stage when some of the wells began to pump gravel pack material causing excessive pump wear. Consulting engineers and city officials recognized the need for replacement wells. Test holes and subsequent production wells were optimumly placed for maximum yield and minimum particle intake. Special attention was given to gravel packing the well screen, casing and grouting procedures. Development was realized by careful backwashing to insure the integrity of the carefully placed gravel pack. Pumping tests were conducted at each production well after completion of the development. Transmissivity values were generally 17,000 to 23,000 gpd/ft. All wells were completely sand free. (Heiss-NWWA)
W76-05559

AIR ROTARY DRILLING WITH ORGANIC POLYMERS OFFERS MANY BENEFITS,
Universal Oil Products Co., Denver, Colo. Johnson Div.
For primary bibliographic entry see Field 8B.
W76-05562

PROPER SELECTION OF GRAVEL PACK IS KEY TO SUCCESSFUL WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
A. J. Smith.
The Johnson Driller's Journal, Vol. 47, No. 4, p. 1-3, July-August 1975, 3 fig.

Descriptors: *Gravels, *Particle size, *Permiability, Fine aggregates, Sand pumping, *Well screens, Water wells.
Identifiers: *Gravel pack design, Grain size distribution, Sand control.

The use of a gravel pack increases particle size and permeability in the zone immediately surrounding the well screen. The geologic conditions of a fine uniform sand, a thick artesian aquifer, a loosely cemented sandstone and an extensively laminated formation favor the use of gravel packing material. The gravel packing material must be accurately sized to the aquifer to avoid wells that pump sand. Recently, it has been suggested that the medium gravel size should fall within a range of five to six times the formation particle diameter at the 50 percentile point of the sieve analysis. Steps are given for the design of artificial gravel packs for water wells. (Heiss-NWWA)
W76-05565

SIMPLE PROCEDURES CAN HELP REDUCE DRILL PIPE DAMAGE,
Chevron Oil Co., New Orleans, La.
R. W. Nicholson.
World Oil, Vol. 178, No. 6, p. 73-77, May 1974, 6 fig, 11 ref.

Descriptors: *Drilling, *Fatigue(Mechanics), *Drilling equipment, Pipes, Wells, *Failure(Mechanics), *Tension, Strain, Stress, Mechanical properties, Testing procedures.
Identifiers: *Drill pipe failure, *Crooked holes, *Doglegs, Tool joints.

Doglegs have long been recognized as a major factor contributing to drill pipe failures and other drilling problems. Such problems can be greatly reduced by limiting dogleg severity to acceptable values. Crooked holes contribute to drill pipe fatigue and tool joint damage and increase chances for twist-offs, washouts, and casing wear. Drill pipe fatigue can occur due to sufficiently large alternating bending stress caused by rotation in a dogleg. This bending of drill pipe can also result in failure of the tool joint. (Gass-NWWA)
W76-05572

HOW STEAM IS PRODUCED AND HANDLED AT THE GEYSERS,
R. E. Snyder.
World Oil, Vol. 180, No. 7, p. 43-46, June 1975, 10 fig, 1 tab, 6 ref.

Descriptors: *Geysers, *Steam, Electric power plants, *California, Drilling, Geothermal studies, Wells, Reservoirs, *Energy conversion, Cooling towers, *Condensation, Drill holes, *Heat flow.
Identifiers: *Cluster wells, *The Geysers(Calif), *Geothermal energy.

Five drilling rigs are presently placing clusters of new geothermal wells in The Geysers area in anticipation of the construction of additional power plants. The new plants will raise total output from the current 502 megawatt (mw) to 897 mw. The geothermal reservoir consists of highly fractured, slightly metamorphosed sedimentary and igneous rocks of Cretaceous and upper Jurassic age. The heat source is probably a large magmatic body buried perhaps 10 miles or more below the surface. Steam production at The Geysers will gradually decline, not due to well bore plugging, but to depletion of reservoir pressure. Some recharging is possible and presently the remaining 20 percent of the condensed liquid from the generating plant is reinjected. The drilling of wells is made difficult by steep terrain. To compensate for this, directional drilling is often used. Deviated holes are also desirable since the drift can be controlled to cause the hole to cut as many fault planes as possible to expose maximum fracturing. Water enters the generating plant at 350 F as dry steam. The steam strikes the turbine and the heat energy is converted to rotational velocity which is transferred directly to the generator. The steam is then condensed in a chamber where its temperature is reduced to 120 F. This hot water is pumped to the cooling tower. Eighty percent of the steam condensate is evaporated and the remainder is reinjected into the producing reservoir. (Gass-NWWA)
W76-05574

TECHNICAL-ECONOMIC PRODUCT DESIGN AS TYPIFIED BY A SEWAGE PUMPING INSTALLATION,
For primary bibliographic entry see Field 5D.
W76-05591

STUDY OF TURBINE MIXERS FOR FLOW-THROUGH FLOCCULATION CHAMBERS (VYZKUM TURBINOVYCH MICHADEL PRO PRUTOCNE FLOKULACNI KOMORY),
Vyzkumny Ustav Chemickych Zarizeni, Brno (Czechoslovakia).
For primary bibliographic entry see Field 5D.
W76-05703

PLASTIC PIPE, PRESSURE SEWERS, MARK EXPANSION,
Williams and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 5D.
W76-05765

AUTOMATION CAN BE SIMPLE,
For primary bibliographic entry see Field 5D.
W76-05797

8D. Soil Mechanics

USE OF FORMATION STABILIZER - A VALUABLE TECHNIQUE,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8A.
W76-05564

PROPER SELECTION OF GRAVEL PACK IS KEY TO SUCCESSFUL WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8C.
W76-05565

SEISMIC INSTRUMENTATION OF DAMS,
California Univ., Berkeley, Seismological Lab.
B. A. Bolt, and D. E. Hudson.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 101, No. GT11, Proceedings Paper 11697, p 1095-1104, November 1975. 3 fig, 13 ref, 2 append.

Descriptors: *Dams, *Dynamics, Earthquakes, Seismic studies, Seismographs, Seismology, Instrumentation.
Identifiers: *Accelerometers, *Geotechnical engineering instrumentation, Seismic detection.

The desirability of installing seismic instruments on and near major dams was explained. Two types of instruments are required: (1) strong-motion accelerographs for recording potentially destructive ground shaking and resulting dam vibrations, and (2) sensitive seismographs for determining the local seismicity. A minimum of two strong-motion accelerographs should be installed on the dam and a minimum of two should be installed in the immediate vicinity of the dam. Each accelerograph should record three components of motion, should have a natural frequency of approximately 20 Hz, a recording speed of approximately 1 cm/s. The sensitive seismographs are intended to record the local seismicity in the vicinity of the dam site before construction, and to detect any changes in seismicity during reservoir filling. A minimum of three seismographs was recommended for installation in the vicinity of the dam site. A vertical-component seismometer (1 Hz - 5 Hz) with visual recorder and approximately 10,000 magnification at 1 Hz was recommended. (Lee-ISWS)
W76-05667

8E. Rock Mechanics and Geology

SEISMIC INSTRUMENTATION OF DAMS,
California Univ., Berkeley, Seismological Lab.
For primary bibliographic entry see Field 8D.
W76-05667

FINITE ELEMENT MESH GRADATION FOR SURFACE WAVES,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
G. Segol, J. F. Abel, and P. C. Y. Lee.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 101, No. GT11, p 1177-1181, November 1975. 2 fig, 12 ref.

Descriptors: *Seismic waves, *Finite element analysis, *Wavelengths, Computers, *Model studies, Seismology, Analytical techniques, Free surfaces, Methodology.
Identifiers: *Mesh gradation, Elastic waves, Discretization.

Because the computer implementation of finite element techniques in the study of propagating seismic surface waves requires large commitments of core storage and execution time, analysts need be concerned both with minimizing the number of elements and nodes used and with evaluating the accuracy of the chosen discretization. The previously presented criteria were investigated to estimate how much coarser the element mesh can be made for regions away from the surface. Though the criterion for the ratio of element dimension perpendicular to the direction of propagation to the minimum wavelength of elastic waves propagating in the system should not exceed 1/12 is necessary near the surface for finite elements to produce highly accurate predictions of surface wave amplitudes, little deterioration in accuracy was detected if this ratio is equal to or less than 1/6 at the fixed base. (Singh-ISWS)
W76-05919

8G. Materials

SIPHON SYSTEM YIELDS CHILEAN PLANT MORE WATER,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8C.
W76-05550

PVC PIPE IN WATER DISTRIBUTION: RELIABILITY AND DURABILITY,
Petrochemicals Co. Inc., Fort Worth, Tex.
W. D. Nesbeitt.
Journal of the American Water Works Association, Vol. 67, No. 10, p. 576-581, October 1975, 7 fig., 1 tab.

Descriptors: *Plastic pipes, *Distribution systems, Tensile strength, Materials testing, Stress, Strength.
Identifiers: PVC pipes.

Defined and discussed are both the disadvantages and advantages afforded the consumer in the use of polyvinyl chloride (PVC) pipe. PVC pipe has proved to be a high quality water-piping material offering water-utility operators many advantageous properties that provide assurance of reliability and durability in water distribution systems. It is nearly non-biodegradable. PVC will not deteriorate or breakdown under the attack of bacteria or other microorganisms. However, PVC pipe is not suited to exposure to heavy concentrations of organic solvents, aromatics and ultraviolet rays. The dielectric properties of PVC render it perfectly suited for electrical insulation. The same dielectric properties also make it difficult to locate buried PVC pipe. PVC is somewhat flexible and will bend to compensate for shifting soil conditions. The operating temperatures of PVC pipe are between 0-120 degrees F. It is rated for performance at 73.4 degrees F. Lower temperatures cause it to become brittle and less flexible. Higher temperatures result in a loss of tensile strength and stiffness. Plastic pipe can withstand short-term pressure surges but is less capable of withstanding long-term pressure surges than cast iron pipe. Failure to realize and capitalize on the various benefits afforded by the use of PVC pipe in water-utility systems can limit or eliminate some of the advantages afforded by the use of such pipe in modern municipal water-distribution systems. (Gass-NWWA)
W76-05552

RIG RESTORATION.
Water Well Journal, Vol. 30, No. 2, p. 26-27, February 1976.

Descriptors: *Drilling equipment, *Maintenance, Rehabilitation, Paints, *Cleaning, *Corrosion control, Abrasive blasting.
Identifiers: *Preventive maintenance, Compressed air cleaning, Solution cleaning, *Drilling rigs.

Preventive maintenance of well drilling rigs during the winter months is discussed. Cleaning supplies and methods are described in detail. A checklist of suggested procedures is given. Priming and painting methods are mentioned including ionized paint spraying procedures. (Heiss-NWWA)
W76-05555

A DRILLER'S GOOD FRIEND - THE ELECTRIC LOGGER,
Universal Oil Products, St. Paul, Minn. Johnson Div.
R. W. Riewe.
The Johnson Drillers Journal, Vol. 47, No. 6, p 1-4, November-December 1975.

Descriptors: *Logging(Recording), *Electric well logging, *Resistivity, Drilling fluids, Water supply development, Drilling equipment, *Drillers logs, Boreholes, Wells.
Identifiers: Mud probe, Borehole diameter.

The electric well logger is a valuable tool in any well drilling operation. When used with the driller's well log it provides a detailed description of every formation the drill bit encounters. The electric well logger measures the electronic parameters of spontaneous potential of the formation and resistivity of the borehole fluids. However, an anomalous reading may occur when borehole fluids encountered in the previous formation contaminate the fluids of another formation thereby creating a masking effect in the recorded log. Examples of this effect are given. (Heiss-NWWA)
W76-05561

AIR ROTARY DRILLING WITH ORGANIC POLYMERS OFFERS MANY BENEFITS,
Universal Oil Products Co., Denver, Colo. Johnson Div.
For primary bibliographic entry see Field 8B.
W76-05562

USE OF FORMATION STABILIZER - A VALUABLE TECHNIQUE,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8A.
W76-05564

EXPERIMENTAL WELL FIELD IS PUT TO MANY USES,
G. M. Erickson.
The Johnson Driller's Journal, Vol. 47, No. 4, p. 4-5, 12, July-August 1975, 1 fig.

Descriptors: *Drill holes, *Water wells, Well casing, Well screens, Rotary drilling, Well spacing, Testing procedures, Minnesota, *Test wells, Pumping, Tests.
Identifiers: *Experimental well field, Water well testing.

An experimental and research well field was constructed by UOP Incorported, Johnson Division at New Brighton, Minnesota. The facility will serve staff engineers and geologists as well as provide a demonstration site for the company's geophysical equipment and products. An unconsolidated formation was selected that could produce a maximum yield of 200 gallons per minute. The site was selected for a study of local well logs. Two cable tool wells and seven rotary wells were originally planned. Very accurate samples were taken throughout the drilling operation. The cable tool wells were planned as one 6 inch well and one 10 inch production well. The 6 inch well was developed using the single-pipe airline method for 13 hours. After development, it was concluded that the well should be capable of pumping at a rate of 1,500 to 2,000 gallons per minute on a short term basis. As a result, the plan to drill a 10 inch well was abandoned. In its place a new well was designed with a 16 inch casing at the top of the aquifer and 10 inch telescoping well screen. Coarse pea gravel was then used as a gravel pack. The well was developed using a process of alternate jetting with water and pumping air. The rotary wells were drilled at the same time as the cable tool wells. A 6 hour pumping test was performed in February 1972. Pumping rate was 1050 gallons per minute. Transmissibility was determined to be in excess of 400,000 gallons per day per foot with a specific capacity of 181 gallons per minute per foot of drawdown and a well efficiency of 90 percent. (Heiss-NWWA)
W76-05569

SIMPLE PROCEDURES CAN HELP REDUCE DRILL PIPE DAMAGE,
Chevron Oil Co., New Orleans, La.
For primary bibliographic entry see Field 8C.
W76-05572

CATHODIC INNER AND OUTER PROTECTION FOR A DOUBLE SYPHON FOR WASTE WATER (KATHODISCHER INNEN-UND AUSSENSCHUTZ FUER EINEN ABWASSER-DOPPELDUEKER),
For primary bibliographic entry see Field 5D.
W76-05584

SEISMIC INSTRUMENTATION OF DAMS,
California Univ., Berkeley, Seismological Lab.
For primary bibliographic entry see Field 8D.
W76-05667

PLASTIC PIPE, PRESSURE SEWERS, MARK EXPANSION,
Williams and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 5D.
W76-05765

8I. Fisheries Engineering

MACROBENTHIC POPULATION DYNAMICS IN INDIANA WATERS OF LAKE MICHIGAN IN 1970,
Ball State Univ., Muncie, Ind.
For primary bibliographic entry see Field 5C.
W76-05623

AN ICHTHYOFAUNAL SURVEY AND DISCUSSION OF FISH SPECIES DIVERSITY AS AN INDICATOR OF WATER QUALITY, CODORUS CREEK DRAINAGE, YORK COUNTY, PENNSYLVANIA,
York Coll., Pa.
For primary bibliographic entry see Field 5A.
W76-05634

FECUNDITY OF THE BROWN BULLHEAD, ICTALURUS NEBULOSUS (LE SUEUR) IN A MINE ACID POLLUTED RIVER,
West Virginia Univ., Morgantown.
D. B. Fowler.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 167 $5.00 in paper copy $2.25 in microfiche. MS thesis 5 fig, 6 tab, 58 ref, 1 append. OWRT A-017-WVA(4), A-001-WVA(4).

Descriptors: *Fish, *Bullheads, *Fecundity, *Acid mine water, Water pollution effects, West Virginia, Sexual maturity, Fish reproduction, Fish eggs, Spawning, Acidic water.
Identifiers: *Brown bullhead, *Monongahela River(W Va).

The sex ratio for brown bullheads in the Monogahela River, West Virginia, was 1.30 males:1.00 females in 1966; the true ratio was probably closer to 1.74:1.00 during non-spawning periods. Egg diameters from ripe females were 1.61-2.82 mm. Egg sizes did not differ between ovaries from the same female. Ova frequency distributions from mature bullheads were unimodal, indicating a single spawn per season. Ova diameters were larger and fecundity higher in 1966 than in 1968. Females reached maturity when approximately 200 mm long and weighed 100 g. Ripe ova were slightly larger than 2 mm in diameter. Egg diameter was not related to fish size but was inversely proportional to fecundity. Fecundities were 818-7071 for ripe females and more closely related to gross weight than total body length. Fecundity was not related to spawning time. Regression analyses indicated than fecundity-length and fecundity-weight relationships were curvilinear. The best fitting regression line was produced by relating log fecundity to gross body weight. Evidence of ripe and spent ovaries during late spring and summer months suggested a lengthy spawning season. Bullheads did not appear to have suffered reproductive impairment due to mine acid pollution which caused pH variations from 3.4-6.0. (Buchanan-Davidson--Wisconsin).
W76-05641

ACCUMULATION AND ELIMINATION OF DIELDRIN BY CHANNEL CATFISH (ICTALURUS PUNCTATUS),
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 5C.
W76-05642

PARASITES OF FRESHWATER FISHES. A REVIEW OF THEIR CONTROL AND TREATMENT,
For primary bibliographic entry see Field 2H.
W76-05953

STREAM BED STABILIZATION IN ENFIELD CREEK, NEW YORK,
New York State Dept. of Environmental Conservation, Delmar. Wildlife Research Lab.
B. J. Jackson.
N Y Fish Game J. 21(1), p 32-46, 1974.

Descriptors: *New York, *Streambeds, Stream stabilization, Trout, Gabions, Structures, Gravels.
Identifiers: *Enfield Creek(NY), *Streambed sills.

This study was undertaken to observe the performance of bed sills in stabilizing a high-gradient trout stream subjected to severe headcutting. Gabion structures were installed in Enfield Creek, New York, in 1967. A topographical survey of the stream bed was made prior to installation and in 1968, 1970, 1971 and 1973. The sills were immediately effective in arresting headcutting and in accumulating gravel material and they had a distinct stabilizing effect for almost 0.8 mile downstream. Gabion construction is discussed and a theory for partial failure of the 2 lower sills during the June 1972 flood is postulated.--Copyright 1974, Biological Abstracts, Inc.
W76-06145

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

CANADIAN WATER RESOURCES INFORMATION: A NETWORK APPROACH,
Department of the Environment, Burlingto (Ontario).
For primary bibliographic entry see Field 10D.
W76-05952

10C. Secondary Publication And Distribution

SOCIAL IMPACT ASSESSMENT: AN ANALYTIC BIBLIOGRAPHY,
Brown Univ., Providence, R. I.
For primary bibliographic entry see Field 6B.
W76-05820

SECOND ANNOTATED BIBLIOGRAPHY ON BIOLOGICAL EFFECTS OF METALS IN AQUATIC ENVIRONMENTS,
Environmental Research Lab., Narragansett, R.I.
For primary bibliographic entry see Field 5C.
W76-05863

10D. Specialized Information Center Services

CANADIAN WATER RESOURCES INFORMATION: A NETWORK APPROACH,
Department of the Environment, Burlingto (Ontario).
J. P. H. Batteke, D. M. Heaps, and M. A. Mercier.
Inf Storage Retr. 10(3/4): 85-99. Illus. 1974.

Descriptors: *Canada, *Information storage and retrieval, *Information exchange, Data collections, Water resources, Indexing, Thesauri, *Networks, *Documentation, Publications.
Identifiers: *WATDOC.

The Water Resources Document Reference System, Environment Canada (WATDOC), was established to increase awareness of environmental information related to water resources. Participants are found throughout Canada at all levels of management and research. The designers of WATDOC reconcile the conflicts posed by a centralized data base operated by a decentralized community through the recognition of certain economic conditions and through the use of network techniques. Every effort is made to obtain the cooperation of users and suppliers of information, to provide access to data bases, to incorporate advances in technology, and to search for system improvement. 'Invisible colleges' are established through seminars and personal contact and correspondence. The information in the data base is identified by indexing and classification methods combined, through the use of a thesaurus concordance. All data bases within the network may be accessed directly by on-line or batch methods, by telephone-query or specialist-terminal interaction, or by mail. Relevant research is supported. Research related to this report resulted in the development of a thesaurus concordance and in a set of programs to support an interactive on-line classification-linked thesaurus for indexing, classification, search and retrieval. Implementation, operation, and development of WATDOC are discussed in detail.--Copyright 1974, Biological Abstracts, Inc.
W76-05952

10F. Preparation Of Reviews

SEWER FLOW MEASUREMENT - A STATE-OF-THE-ART ASSESSMENT,
EG and G Washington Analytical Services Center, Inc., Rockville, Md.
For primary bibliographic entry see Field 05D.
W76-05865

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